

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 4510, 4544, 4565, 4612-3, 4637, 4682.

0 (048.1). Bibliographical Lists

See also Nos. 3675, 3711, 3867, 4162-3, 4191, 4719, 4771, 4838.

3620. HOFMAN, J., and KLICPEROVÁ, J. [Compilers]. *Československá lesnická bibliografie 1950-1952. [Forestry bibliography for Czechoslovakia 1950-52.]* Výzkumný Ústav Lesního Hospodářství, Zbraslav-Strnady. 1956. pp.149. [Cz.]

Contains over 4000 titles arranged according to the Flury system of decimal classification.

3621. BĂLĂNICA, T., and DIMITRIU, V. *Contribuții la bibliografia forestieră românească; publicații apărute în anul 1955. [Contributions to Rumanian forest bibliography: publications issued in 1955.]* *Rev. Pădurilor* 71 (7-8), 1956 (463-70; 545-6). [Rum.]

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

3622. *Verzeichnis der Zeitschriften und Serien.* Stand Januar 1957. [List of periodicals and series: the position in January, 1957.] Bundesforschungsanstalt für Forst- und Holzwirtschaft, Reinbek. 1957. pp. 53. [G.]

Lists by countries the publications covered by the Bundesforschungsanstalt in preparing its *Bibliographie des forst- und holzwirtschaftlichen Schrifttums*. Periodicity and abbreviations used are given.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

See also Nos. 4455-8.

111. The Atmosphere. Meteorology. Climate and Microclimate

111.8. Climatology. Climate and Microclimate

See also Nos. 3807, 3811, 3816-7, 3827, 3859, 4033-4, 4087, 4275.

3628. VOLKERT; VOLKERT, and ZOBEL. *Arbeiten*

3623. *Revista forestal argentina.* Rivadavia 8871, Buenos Aires, Suc. 7. Quarterly. Price \$ U.S. 3-00 p.a.

Vol. 1, No. 1, for Feb./Mar. 1957, contains some 48 pages. Citation in *F.A.: Rev. for. argent.*

0 (084.3/.4). Maps. Atlases

3624. *Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. [Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi [parts].]* Institut pour l'Étude Agronomique du Congo Belge, Bruxelles. 1956. [F.]

No. 8, by M. F. van Oosten and A. van Wambeke, covers the Lufira Valley (Haut Katanga), the parts here noticed (A and C, sheets 1 and 2; scale 1 : 100,000) dealing with soils and land utilization of the Kiubo and Mokeba regions, including an explanatory note on the soils map (pp. 71; 21 refs.).

3625. *Forest resources map of Malaya.* Survey Department, Federation of Malaya. 1954. 1 sheet. Scale 1 : 760,320.

0 - - 011. Terminology. Nomenclature

See also Nos. 4283, 4733.

3626. *Forestry—timber—lumber: French-English vocabulary of terms used in operations.* *Rev. int. Bois* Nos. 224 & 227, 1957 (15-6; 91-4).

Includes the names of ca. 90 of the common tree species and nearly 500 terms.

3627. [Technical terms for forest tree seeds.] *J. Jap. For. Soc.* 38 (7), 1956 (279-80). [Jap.]

Gives definitions and Japanese equivalents for English and German terms.

zur forstlichen Geländeklimaerkundung und -Kartierung (Standorts-Klimakartierung). Der Einfluss des Grossreliefs im Mittelgebirge auf die Lufttemperatur. Der Einfluss des Grossreliefs auf die Höhe der Aufgleitniederschläge im Mittelgebirge. [Investigating and mapping forest site climate. The influence of large-scale topography on air temperature and orographic precipitation in the central mountain region [of Germany].] *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (87-98). [G.]

Three articles discussing principles and methods and describing practical work near Hann. Münden.

3629. MIKI, S. *Remains of Pinus koraiensis* S. et Z. and associated remains in Japan. *Bot. Mag., Tokyo* 69 (820/821), 1956 (447-54 + 1 set of photos). 11 refs. [E.e.] I.M.I.

This species, associated with subalpine conifers, is used as an index for calculating the depression of temperature ($7.4^{\circ} \pm 2.0^{\circ}\text{C.}$) at sea level during the Pleistocene, as compared with the present time. The absence of broadleaved evergreens and the frequent presence of deciduous broadleaved trees in the remains support this.

3630. BAUMGARTNER, A. Untersuchungen über den Wärme- und Wasserhaushalt eines jungen Waldes. [Temperature and water balances in a young forest stand.] *Berichte des deutschen Wetterdienstes, Bad Kissingen* 5 (28), 1956. pp. 53. 124 refs. [G.g.]

An investigation of the microclimate of a dense young Spruce stand in S. Bavaria of 8.7 m. mean height. Closely spaced profile measurements were taken at heights from ground level to ca. 5 m. above the level of the closed canopy (ca. 4 m.) and up to 10 m. in some cases, and at similar heights on an adjoining clear felling, of radiation, air, soil and plant temperatures, air humidity, vapour-pressure gradients, evaporation, dew formation, and air turbulence for the period 28 June to 8 July 1952. Instruments and methods are described and the concepts underlying the computations are discussed. From measurements of soil moisture down to 40 cm. depth, expressed both as a weight and as a volume ratio, it is computed that the total evapotranspiration loss of the stand on each of the hot rainless days of the period amounted to ca. 7 mm., mainly due to transpiration, most of the water coming from the lower layers of the soil. The total loss on the clear-felled area, which at the beginning of the period contained slightly more moisture, was slightly greater. Finally, an attempt is made to compute, from the data available, a thermodynamic energy balance, i.e. to trace the utilization of the net radiation energy in the heating of soil, air and plant mass, in the movement of air, the metabolism of the plants and evapotranspiration. The last accounted for ca. $\frac{3}{4}$ of the total.

3631. PRIEHÄUSSER, G. Die Hochmoore im Osten des Forstamtes Buchenau und deren klimatischer Einfluss auf die im Westen anschließende Waldlandschaft. [Raised bogs in the eastern part of the Buchenau forest district and their climatic influence upon the adjoining forest in the western part.] *Forstwiss. Cbl.* 75 (7/8), 1956 (207-22). 6 refs. [G.g.]

A study of the topography, geology and hydrology of the area, the development and nature of the peat bogs, and their influence upon the climate of the area and that of the western adjoining forest land. The species composition and growth of the forests are markedly affected by the climate, which is characterized by low temperatures, lack of sun, and high rainfall in comparison with other sites at the same altitude.

114. Soil. Soil Science

114.1. Soil Physics

See also Nos. 3630, 3654-5, 3663-4, 3773, 4027, 4430-1, 4441.

3632. MASHIMO, Y. [Studies on the water of forest soils. (I). Black soils on the Dando National Forest.] *J. Jap. For. Soc.* 38 (2), 1956 (49-53). 8 refs. [Jap.jap.e.e.]

The soils were classified according to their suitability for *Chamaecyparis obtusa* as: (1) occurring on flat hill-tops, very poor; (2) on gentle slopes, poor; (3) on lower slopes, good. Physical (moisture, permeability and mechanical composition) and chemical properties of the soils are shown in graphs and tables. Growth of *C. obtusa* was most closely related to physical properties. *From author's summary.*

3633. MASHIMO, Y., and KUBO, T. [Studies on the water of forest soils. (II). Brown forest soils on the Dando national forest.] *J. Jap. For. Soc.* 38 (3), 1956 (97-102). 4 refs. [Jap.e.e.]

Data on pF values, permeability, composition by volume (soil solids, roots, gravel, water, air), mechanical composition, and chemical properties are given in graphs and tables.

3634. OHMASA, M., and MASHIMO, Y. [Studies on the water absorption of forest soils.] *For. Soils Japan For. Exp. Sta. Meguro, Tokyo* No. 8, 1957 (25-42). 15 refs. [Jap.e.e.]

Results of measurements on a number of soils by 3 different methods include the following: (1) the pF/moisture-content curves of most soils showed the normal hysteresis loop, but the hysteresis phenomena for dry brown forest soils and dry podzolic soils were exceptional. (2) In brown forest soils, water absorption of dry brown forest soils was slow when they were dry, that of wet brown forest soils was fast when they were dry and dropped gradually with increasing soil moisture, and that of moderate soils was intermediate. (3) Podzols and podzolic soils generally absorbed water slowly, but dry podzols absorbed water very slowly when dry, and wet podzolic soils absorbed water very rapidly. (4) A₂ and B horizons in all types of soil absorbed water rapidly and showed no distinct hysteresis effect. A soil developed by ectotrophic mycorrhiza absorbed no water when dried but absorbed water rapidly when treated by ether extraction. Some chemical and mechanical properties of the soils are tabulated. *From authors' summary.*

3635. MASHIMO, Y. [Moisture condition (pF) of forest soil.] *For. Soils Japan For. Exp. Sta. Meguro, Tokyo* No. 8, 1957 (43-66). 10 refs. [Jap.e.e.]

Results of measurements on 6 types of brown and 3 of black forest soil, based on 204 samples from 85 profiles, are given in tables and graphs. They show a close relationship between classification by morphological characteristics and by moisture conditions.

3636. NICHOLSON, R. Water movement in a sandy soil. *Abstr. of thesis, in J. Oxf. Univ. For. Soc. (Ser. 4)* No. 5, 1957 (17-21). 2 refs.

The movement of available water in a freely-draining sandy woodland soil was studied by means of porous pencils. After a period of rain followed by dry weather, 'peaks' of available moisture were recorded in successively deeper layers of the soil. The 'waves' of moisture passing through the soil were sometimes merely narrow bands, < 6 in. thick. The data suggested that movement was more rapid in moist than in dry soils. During a hard frost, available water was very scarce throughout the profile. Considerable amounts of water are rendered available when a soil thaws, even though there may have been very little precipitation during the period of frost.

3637. IKEDA, S. [Studies on the atmospheric phenomena of sand dunes (III). Comparison of soil temperatures inside and outside the forest on sand dunes.] *Transactions of the Tottori Society of Agricultural Science, Tottori* 10 (4), 1955 (39-45). 3 refs. [Jap.e.] C.G.B.

Presents tables and graphs of temperatures from the surface to 100 cm. below ground, based on 1 year's measurements at Hamasaka forest. Mean surface temperatures inside the forest were 68.4% and mean soil temperatures 90% of those in the open. Relations between depth and soil temperatures were not uniform. Both maxima and minima were greater in the open. *From author's summary.*

3638. WALLIS, G. W., and WILDE, S. A. Rapid method for the determination of carbon dioxide evolved from forest soils. *Ecology* 38 (2), 1957 (359-61). 3 refs.

The apparatus and the method of operation are described and some results given. Air is extracted from the soil through glass funnels or metal cylinders 5 in. in diam. These are firmly embedded in the soil, and the air is drawn through rubber tubing provided with capillary tips. The CO₂ is trapped in a normal solution of NaOH placed in test-tubes. The air suction is completed by a Trico 'Electro Vac' pump operated by a 6-volt storage battery. One 6-volt unit can operate as many as 16 funnels spread over an area of $\frac{1}{20}$ acre. Measurements made on adjacent grassland, hardwood stand and Pine plantation on two different soil types showed that, in each case, the degree of CO₂ evolution decreased in that order. Another series of measurements showed that CO₂ evolution on outwash sands with quack-grass cover was only 2.94 g./sq.m./hour, whereas on an adjacent plot top-dressed with fermenting sawdust compost it was 21.94.

114.2. Soil Chemistry

See also Nos. 3632-4, 3647-9, 3651, 3773-4, 3778.

3639. KAWADA, H. [A study on correlations between chemical properties and types of forest soil.] *For. Soils Japan For. Exp. Sta., Meguro, Tokyo* No. 8, 1957 (81-124). [Jap.e.e.]

Analytical methods used are described. Data on relief, site conditions, morphological characters, vegetation and chemical properties of a number of soils are tabulated and discussed. The sites were: the Tokyo City Forest (*Larix leptolepis/Chamaecyparis obtusa*), *Cryptomeria japonica* sites in the

Iwase and Nibuna National forests, *Pinus densiflora* sites in the Asama National forest, deciduous forest sites (*Castanea crenata/Quercus serrata*, *Zelkova serrata*), and the black soils of the Iwase and Araki national forests. In the black-soil group, no clear correlation was found between chemical properties and type of soil classified by morphological characteristics. Dry types of brown forest soils will become dry podzolic soils at high altitudes or in cold climates. Chemical differences between drier and wetter soils are attributed to differences in decomposition of forest litter. *From author's summary.*

3640. KAWADA, H., and TAKAMI, M. [Studies on the Japanese Cedar forest soils in Akita district and black soils. (4). On the Japanese Cedar forest soils in Iwase and Nibuna National Forests.] *J. Jap. For. Soc.* 38 (7), 1956 (259-62). 6 refs. [Jap.jap.e.e.]

Discusses the pH and chemical relationships of the soils. In general, the growth of planted Japanese Cedar [*Cryptomeria japonica*] is superior on fairly moist to wet brown forest soils and inferior on podzolic and slightly podzolized soils and on dry brown forest soils with crumb and granular structure in the A horizon, where the Japanese Cedar is dominated by naturally invading conifers and broadleaved species.

3641. ZÁČEV, B. D. O zapasah pitatelnyh vešestv v profile lesnoi počvy. [The nutrient reserves in the profile of a forest soil.] *Počvoved.* 1956 (11), (59-62). 2 refs. [Russ.] A.P.B.

Data are tabulated on the amounts of N, K and P₂O₅ in the soil to a depth of 1 m., for: (a) podzol soil under Spruce; (b) weakly podzolic soils under Spruce and under Oak; (c) grey forest soil under Oak with Lime and Maple; and (d) soils with varying degrees of waterlogging, from podzol to peat soils, in the podzol zone. Of the first three groups (a) is very low in reserves of N, P and K, all of which, and especially N, increase from (a) to (c). Spruce yields decrease with decrease of mobile K and P in the rooting zone, whereas the chief demand of Oak seems to be a high N content. As regards (d) it is emphasized that considerable quantities of nutrients are often present in waterlogged soils in the inaccessible layers below the rooting zone.

3642. SMIRNOVA, K. M. Sezonnye izmeneniya v svoistvah počv hvoynyh i listvennyh lesov. [Seasonal changes in soil properties under coniferous and hardwood stands.] *Počvoved.* 1956 (12), (1-16). 13 refs. [Russ.] A.P.B.

Soil analyses were made at various times from May to Nov. in 1954 and 1955 near Moscow on 4 different sites, under (a) a Spruce stand with a ground cover predominantly of *Pleurozium schreberi*, (b) a Pine stand with a similar ground cover, (c) Birch with a dense mixed herbaceous ground cover, and (d) Birch with an understorey of Lime and a mixed herbaceous ground cover. The soils were strongly podzolic in (a) and (b), sod-podzol (c) and weakly podzolic brown forest soil (d). Tabulated data show water-content and acidity analyses of the A₀₀ and A₀ horizons and the contents of humus, N, and exchangeable Ca in the soil. The total content of ash constituents and N in A₀₀ + A₀ was lowest

for (b) and highest for (d). The Si, Fe, and Al of all stands were especially mobile during the growing season; N, Ca, Mg, and K under Birch were considerably more mobile than under the conifers. The content of mobile forms of Fe and Al in these horizons decreased from spring to summer and rose in the autumn in all cases. The amount of humus in the soil under conifers also decreased (by ca. 30%) between spring and summer and increased in the autumn; under the hardwoods the % of humus was higher and reached its maximum in summer. The amount of fixed Ca was least under (a) and most under (d). Exchangeable Ca showed seasonal variations similar to those of the humus. Low base content and slow mineralization in (a) and (b) lock up nutrient elements in the organic horizons whereas in (c) and (d) the higher rate of turnover for N, Ca, Mg, and K and the consequent neutralization of acids formed during decomposition, are factors operating against podzolization. This is well exemplified in (c), which was a clear felling in coniferous forest colonized by Birch. It is concluded that an admixture of hardwoods should be favoured in the coniferous forests of this zone.

3643. KAWADA, H. [An examination of Tjurin's method for the determination of soil organic carbon and a proposed modification of the chromic-acid titration method.] *For. Soils Japan For. Exp. Sta. Meguro, Tokyo* No. 8, 1957 (67-80). 20 refs. [Jap.jap.e.e.]

Results obtained by Tjurin's chromic-acid titration method and by the combustion method are compared; modifications of the former are recommended.

3644. ŠÁLY, R. Zloženie humusu niektorých lešných pôd ČSR. [Composition of the humus in some Czechoslovakian forest soils.] *Lesn. Čas.* 2 (1), 1956 (1-15). 14 refs. [Slovak.slovak.russ.g.]

Tabulates the results of complete analyses of 9 forest-soil samples, carried out according to Tjurin's method (*Trudy Počvennogo Instituta* 38, 1951), and summarizes the results for humus of podzol with hardpan, rendzina, brown and grey-brown mountain forest soils, and grey soil.

3645. ASAH, M. A study on the nature of organic matter in forest soils with the hypoidite method. *J. Jap. For. Soc.* 38 (6), 1956 (219-22). 5 refs. [E.e.jap.]

The activity indexes obtained for different soil types and for several true humic acids were distinctly different. The method is considered promising for studying the nature of organic matter.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 3639, 3642, 3778-9, 4050-2, 4173.

3646. UPADHYAY, S. Litter addition in grasslands and forests. *Indian For.* 83 (5), 1957 (307-14). 6 refs.

Tabulates and discusses the results of measurements of litter production in a number of grassland and forest types in Madhya Pradesh, and makes comparisons with figures for other types in different parts of the world.

3647. JÁRÓ, Z., and ÁGOSTHÁZY, I. Erdei fák alomjának vizsgálata. (Előzetesjelentés). [Investigations on the litter of trees. (Preliminary report).] *Erdész. Kutatás.*, Budapest 1956 (2), (83-92). 5 refs. [Hu.russ.e.g.]

The author tabulates his findings on the ash contents of the litter of *Fagus sylvatica*, *Quercus robur*, *Q. sessiliflora*, *Q. pubescens*, *Larix decidua*, *Betula verrucosa*, *Acer campestre* and *Carpinus betulus* and the pH of its diluted suspensions. Total ash is not influenced by soil; Fe_2O_3 content and acidity are linearly correlated; the amount of Ca in leaves depends on the CaO content of the soil; Birch and Field Maple are soil improvers by virtue of the CaO and MgO content of their leaves; in soils with high Mg content, *Q. robur* and *A. campestre* store Mg in their leaves. Forests do not increase the alkali content of the soil as only limited amounts of Na are absorbed. Rainwater percolating through litter is acidic and helps to promote soil conditions favourable to forests.

3648. VIRO, P. J. Investigations on forest litter. *Commun. Inst. for Fenn.* 45 (6), 1956. pp. 65. 41 refs. [E.e.fi.]

Part I deals with the chemical composition of green and yellow foliage of Pine, Spruce, Juniper, Birch, Aspen, Alder and Willow, the yellow showing a decrease in weight and nutrient content as compared with the green.

Part II reports laboratory experiments on the decomposition of withered foliage (species as above, plus Larch), in which the water-soluble constituents were periodically leached. During 1 year's observation ca. 30% in weight of the organic matter was lost, 60% as CO_2 , the rest by leaching; for all species except Spruce, the decrease in inorganic was greater than in organic matter, and varied considerably in extent and composition. Relative speed of decomposition *in vitro* generally agreed with accepted opinions, but there were exceptions, e.g. the rapid release of Ca from Larch litter at the start, and the slow decomposition of the nitrogenous matter of Alder leaves. Factors affecting the processes of decomposition and leaching are discussed.

Part III deals on an experimental basis with the quantities of litter produced by various stands of Pine, Spruce and Birch on different soils, its distribution over the year, its components (foliage, bark, woody matter, cones etc.), and their chemical constituents. The bulk of the nutrients was carried to the ground in foliage, but for Pine ca. 40% was contained in other fallen matter.

Part IV discusses conclusions to be drawn on the relation of nutrient requirements of trees and the amounts returned to the soil as litter by the various species, in connexion with their known soil-improving or soil-deteriorating characteristics, and in this context deals particularly with the high % of Si in Spruce litter as a possibly important factor. It is calculated that in the stands studied, Spruce litter increased the amount of SiO_2 in the humus by 34.6 kg./ha. annually.

3649. WITTICH, W., and MAINZHAUSEN, L. Untersuchungen über die Stabilität des Bodenhumus

und seiner Komponenten unter natürlichen Bedingungen. [Research on the stability of the soil humus and its components in natural conditions.] *Z. PflErnähr. Düng.* 75 (3), 1956 (228-43). 13 refs. [G.g.] O.R.S.

Compares the results of investigations on the breakdown of humus on sites with and without litter removal in E. and W. Germany.

3650. CLAUDOT, J. De quelques recherches faites au Maroc concernant les problèmes fondamentaux. [Some results of basic research [with Eucalypts] in Morocco.] [Docum.] *World Eucalyptus Conf.* No. FO/56/E 4-a-1, 1956. pp. 4. [F.]

Summarizes results of (a) soil-biology studies on the rapid decomposition of *E. rostrata* litter without humus formation, and (b) studies with various species, notably *E. rostrata* and *E. viminalis*, on vegetative propagation from immature cuttings, air-layering, grafting, and hybridization etc.

114.4. Soil Classification. Soil Types

See also Nos. 3624, 3631-5, 3639-42, 3644, 3773-4, 3779, 3840, 3850, 4023, 4458, 4466.

3651. TURV, E. Adatok a sziki erdők talajviszonyaihoz. [Contributions to the soil relations of the 'sziki' forests.] *Erdész. Kutatás., Budapest* 1956 (1), (33-52). 15 refs. [Hu.russ.e.g.]

These fertile alkali soils suffer from (a) high acidity in the upper, Ca-deficient, leached layer, which prevents nutrient uptake, and (b) excess of adsorption-bound Mg, rendering soils of good structure and moisture content physiologically dry. Adequate doses of sugar-factory potash before planting will eliminate (a). To counter (b), drought-resistant species should be planted, e.g. *Quercus cerris*, *Q. pubescens*, *Fraxinus ornus*, *Pyrus communis*, *Pinus nigra* var. *austriaca*, *Tilia tomentosa*, *Acer campestre* and *Robinia pseudoacacia*.

3652. SEVIM, M. Batı toroslarda arazi şekli ve kalker topraklarının ağaç yetiştirme değerleri hakkında bazı müşahedeler. [Observations on the limestone soils of the limestone mountains of the West Taurus.] *Istanbul Üniv. Orm. Fak. Derg.* 5A (1/2), 1955 (39-44 + 5 photos). [Turk.g.]

A note on the lodged karst-based soils (red earths) degenerating in the valleys into brown earths) which carry Cedar/Pine/Juniper, mostly of poor growth owing to adverse topography. The vertical fissuring of the rock, by providing deep rooting space stored with fresh soil, plays an important role in producing high-quality pure Cedar on the flatter sites.

3653. OHMASA, M., KUROTORI, T., and KIDACHI, M. [Studies of red soils in Japan. I. Red soils of Migata prefecture.] *For. Soils Japan For. Exp. Sta., Meguro, Tokyo* No. 8, 1957 (1-23). 27 refs. [Jap.jap.e.]

Their distribution, morphology, formation, and vegetation.

3654. THAMES, J. L., and SWENSEN, E. I. Properties of 160 soils of the four North Central States. *Sta. Pap. Lake St. For. Exp. Sta.* No. 39, 1956. pp. 6 + 9 pp. of tpls. 6 refs.

Soil analyses to a depth of 18 in. were made on 160 sites in Illinois, Iowa, Minnesota and Wisconsin. Data are tabulated for each site on vegetation and land use, topography, soil texture, mechanical composition, organic matter, stone content, plasticity constants, bulk density and soil moisture.

3655. TAYLOR, R. E. Some properties of 144 soils from 3 Intermountain states. *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 7, 1956. pp. 6 + 4 tpls. 6 refs.

From soil analyses made in 1954-55 on 144 sites in Idaho, Utah and Nevada, data are tabulated for each site, on vegetation, land use and topography, soil texture and mechanical content, organic matter, stone content, pH, plasticity, bulk density and moisture content.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 3775, 3776, 3838-9, 3840-3, 4032, 4038, 4040, 4055, 4420-32, 4455-8.

3656. AALTONEN, V. T. Die Blattanalyse als Bonitierungsgrundlage des Waldbodens. II. [Chemical analysis of foliage as a basis for assessing the quality of forest soils. II.] *Commun. Inst. for. Fenn.* 45 (2), 1956. pp. 21. 3 refs. [G.fi.]

Presents: (1) Analyses of organic constituents of material similar to that previously analysed [see F.A. 12 No. 226] according to species, age of foliage and forest type. Differences between the latter were smaller than between species, the most marked being an increase in protein content of Birch leaves on better sites. This type of analysis is not considered a practical means of site evaluation. (2) A comparison on a small scale between mineral content of Birch leaves and nutrient content of soil, using for the soil analysis a weak HCl solution, which gave fairly good correlations for CaO and P₂O₅, less good for K₂O, and none for MgO. (3) Preliminary experiments on problems of root competition, in which it was found that the amount of Li found in Pine needles of a tree at a distance of 2 m. from a strip of soil containing Li was actually much greater than in a tree 0.5 m. away from the source.

114.6. Soil Biology

See also Nos. 3638, 3650, 3683, 3780-7, 4051.

3657. MINDERMAN, G. The preparation of microtome sections of unaltered soil for the study of soil organisms *in situ*. *Repr. from Plant & Soil* 8 (1), 1956 (42-8 + 4 plates). 3 refs. [E.e.]

3658. MINDERMAN, G. New techniques for counting and isolating free living nematodes from small soil samples and from Oak forest litter. *Repr. from Nematologica, Leiden* 1 (3), 1956 (216-26 + 3 plates). 6 refs. [E.e.]

The methods described are: (for counting nematodes in small soil samples) a staining and a centrifugal flotation method; (for investigating nematodes in forest litter) extraction by intermittent shaking or direct microscopic investigation after bleaching and staining.

3659. THIELE, H.-U. Die Tiergesellschaften der Bodenstreu in den verschiedenen Waldtypen des Niederbergischen Landes. [*Animal communities in the litter of various forest types in the Niederbergisches Land.*] *Z. angew. Ent.* 39 (3), 1956 (316-67). 50 refs. [G.g.e.] O.H.

The composition of the microfauna plus Collembola of the litter from 5 forest associations in the Rheinische Schiefergebirge was analysed and compared. The fauna fell naturally into groups whose distribution corresponded well with plant associations. Comparison with other biocoenotic analyses indicated that on higher plant-sociological levels, this correspondence holds good for other parts of Central Europe. *From author's summary.*

3660. HARRIS, W. V. Termites and the soil [with discussion]. *Repr. from Soil Zoology: Proceedings of the University of Nottingham Second Easter School in Agricultural Science, 1955, [1956] (62-72 + 3 photos).* 22 refs.

Discusses size of populations, numbers of species, the effect on soil of the destruction by termites of plant residues, the chemical composition of mound soils, and general effects on the soil.

114.7. Soil Surveys and Surveying

See Nos. 4455-8, 4466.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 3630-1, 4025-6, 4032, 4083, 4086, 4458, 4835, 4844.

3661. NEMKY, E. Adatok az erdő különböző elegyarányú farálo manyainak hótárolásához. [*Snow storage in mixed forests of various composition.*] *Erdőmérnöki Főiskola Közleményei, Sopron 1955 (99-105).* 2 refs. [Hu.russ.g.]

In the lower and middle slopes, where a large part of the scanty precipitation falls as snow, evergreen conifers, which intercept it, should be represented as tree-by-tree mixtures or small groups. Unprotected ridges, peaks and bare slopes are especially important and should be planted with shrubs.

3662. NAKANO, H., and KIKUYA, A. [*Deforestation and snowmelting.*] *J. Jap. For. Soc.* 38 (8), 1956 (314-6). 6 refs. [Jap.jap.e.]

Deforestation increased the daily discharge in the first half of the melting period (late February to March) and decreased it in the second half (April to early May). *From authors' summary.*

3663. LULL, H. W. Watershed management. *Rep. Ntheast. For. Exp. Sta.* 1956, 1957 (30-4).

Reviews research in different catchments of the N.E. Region on calibration, soil moisture [see following abstract], erosion control, and snow storage and melting. Data collected over two winters from plots in 6 areas of the Northeast showed that concrete frost intensity, as measured by depth and frequency of occurrence, was 2-3 times greater in open lands than in brush and conifer sites and 7-8 times greater than in hardwood stands. Snow was on average 1.5 times as deep in hardwoods and brush and 1.2 times as deep in conifers as on open land.

3664. LULL, H. W. Forest soil-moisture relations in the coastal plain sands of southern New Jersey. *Abstr. of thesis, in Dissert. Abstr.* 16 (12), 1956 (2268-9). O.R.S.

To secure information on changes in water utilization caused by the conversion of scrub Oak stands to commercial Pine by silvicultural methods, including burning, samples were taken of moisture contents at different levels, and evapo-transpiration was calculated for Pine pole stands, scrub Oak stands, Pine sapling stands, Pine seedling/Oak coppice stands and bare areas. At 0-5 ft. depth, no consistent difference in m.c. was found between the 4 types of stand, but the bare areas tended to be wetter than the forest sites; evapo-transpiration was 21-23 in. for the 4 stands and 17 in. for the bare area. Average maximum m.c. of samples decreased significantly with depth as gravel content increased, but differences between vegetation conditions were not significant; average minimum m.c. varied little with depth but values for the bare areas were significantly greater than those for 2 of the 4 forest types. Daily rates of moisture loss varied significantly with time of year, but differences between vegetation conditions were not significant. Soil moisture sampling below 5 ft. showed that the Pine pole, Oak and regeneration stands dried the soil to 11 to 12 ft., Pine sapling stands to 8 ft. and bare areas to 6 ft. Conversion of Oak to Pine may thus have little effect on water supplies except in intermediate stages. Pine sapling stands and, if Oak coppice is kept out, Pine seedling stands will use less water than mature stands and make more precipitation available for groundwater storage.

3665. GREEN, F. H. W. A year's observations of potential evapo-transpiration in Rothiemurchus. *Repr. from Journal of the Institution of Water Engineers, London 10 (5), 1956 (411-9).* 5 refs.

An apparatus similar to that described by Garnier [cf. *F.A.* 14 No. 36] for measuring potential evapo-transpiration was set up in the Cairngorms Nature Reserve in Oct. 1954, and is described with diagram, and the results are tabulated and discussed. The advantage of measuring potential evapo-transpiration is that it can much more accurately be described as a natural independent climatic factor than can actual evapo-transpiration, and under conditions of adequate water supply it is largely independent of type of vegetation.

3666. BISWELL, H. H., and SCHULTZ, A. M. Surface run-off and erosion as related to prescribed burning. *J. For.* 55 (5), 1957 (372-4). 6 refs.

Studies of run-off and erosion were made on Ponderosa Pine sites in N. California, with gradients ranging from 20 to 43%, after two heavy rainstorms, (a) December 1955 and (b) February 1956. Burning had been done on (a) 8-9 months, and on (b) a few days, earlier. No traces of erosion were found that were attributable to prescribed burning. Partially decomposed duff and debris remaining after burning absorbed water easily and prevented run-off. All cases of surface run-off found in the forest originated on roads, bull-dozer lanes, and skidding tracks cleared to the mineral soil. Pine needles scattered over skid tracks prevented erosion.

3667. TRIMBLE, G. R., JR., and SARTZ, R. S. How far from a stream should a logging road be located? *J. For.* 55 (5), 1957 (339-41).

In autumn 1956, observations were made on a rough access road and a bulldozed section of a new road, in the Hubbard Brook Experimental Forest, New Hampshire, to determine the distance to which sediment is carried. The distance of traces of sediment from 36 log culverts with open tops and the gradient slope below each culvert were measured. The soil is a well drained sandy loam, with impeded drainage in some areas as a result of hardpan. The culverts were 50 ft. apart; the road gradient, 10 to 20%. The relationship between the gradient and the distance the sediment is carried is plotted as a graph. Recommendations are made on the width of land necessary for a filter strip. For municipal watersheds, the suggested strip width is twice that for areas where occasional turbidity can be tolerated.

3668. Integrated management of watershed lands. *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (19-21). 2 refs.

Describes experimental logging operations designed to combine economic timber returns with optimum yields of quality water. Generally a single climbing haul road was fed by secondary roads and skid trails on the contour, to which logs were hauled up hill by power equipment. Drainage courses and streams were avoided. Inside cut slopes on contour roads were shallow and vertical. After logging, contour roads and skid trails were sown with oats and perennial rye-grass for protection against erosion.

3669. GUPTA, A. C. Soil erosion and silt problems and the role of forestry in soil conservation. *Indian For.* 83 (4), 1957 (249-52 + 16 photos).

Illustrated by photographs of erosion in the N. Bengal hills and Sikkim.

3670. CAPPUCINI, G. Methods of soil conservation and land use in high mountain catchments, particularly above the tree limit [in Italy]. [Pap.] 3rd Sess. *FAO European For. Comm., Wkg. Party on Torrent Control* No. *FAO/EFC/TORR.* 3, 1956. pp. 19. 8 refs. [E.]

Discusses (a) legislation, administration, subsidies etc., (b) treatment of stable and unstable soils by engineering works, reforestation and revegetation, e.g. the *gradoni* system, and the interplanting or replacing of *Pinus mugo* by *P. mugo* var. *uncinata* (better for avalanche protection) and (c) improvement of pastures and their management, etc. [Cf. *F.A.* 17 No. 66.]

3671. NAEGELI, G. Report to the Government of Yugoslavia on the prevention of erosion and torrent action. Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 599, 1957. pp. 43.

3672. YEOMANS, P. A. The Keyline plan. The Author, 537 Elizabeth Street, Sydney. 1954. pp. 120 + 27 photos.

Describes a system of soil cultivation, devised by the author, and designed to conserve soil moisture, prevent erosion and increase fertility. The essential factor in this system, the 'keyline', is a level or sloping line extending in both directions from a

point in a valley called the 'keypoint'. This marks or divides the two types of relationship, always in the same vertical interval, that a valley bears to its ridges. In one of these relationships, that above the keyline, the valley will be narrower and steeper than the ridges on either side of it. In the second relationship, below the keyline, the valley will be wider and flatter than its adjacent ridges or shoulders. Any property that includes a watershed in its area has one or more keylines. In the author's system (illustrated by plans, photos and descriptions of his own estates) all cultivation is done parallel to this line, with the effect of counteracting the natural tendency of rainwater to concentrate in the valley and diverting it instead along the slopes for a maximum period. The keyline is marked by a timber strip.

3673. MORRIS, J. Y. Soil conservation practice in France. Part II. *N.Z. J. For.* 7 (3), 1956 (87-95). 5 refs.

[Cf. *F.A.* 17 No. 2419.] In this second article on counter-erosion practices, there is a brief geographical and historical discussion of New Zealand high country. Possible application of French corrective measures is then considered, and some engineering works are described in detail. The need for a comprehensive survey of New Zealand high-country is stressed. Such a survey should aim at assessing the grazing potential of various high-country plant communities. There is need for intensive investigation into the possibility of introducing exotic species into high-country forest and pasture, as well as into methods of protecting existing indigenous species. Specialized training in watershed management is essential if the many complex problems in New Zealand are to be solved. *From author's summary.*

3674. LOGAN, P. C. Some problems in the control of wild and domestic animals in a critical hydro-electrical catchment [in New Zealand]. *N.Z. J. For.* 7 (3), 1956 (68-75). 6 refs.

The valleys of the Avoca and Harper Rivers have been used for sheep grazing for nearly 100 years. Red deer, chamois, rabbits, hares and opossums have been present for 40 to 100 years. The total number of wild plus domestic animals now clearly exceeds the safe carrying capacity of the land, particularly in view of the use made of the water yield for power generation. Animal control operations, under way or proposed, are outlined. Drift fences are to be erected for control of domestic stock and huts are to be built at strategic points to facilitate wild-animal control. Pellet lines have been established and these will provide much required information relative to the seasonal movements of the various groups of animals and to the population densities of each from point to point. This information will permit the design of appropriate control measures and assessment of their effectiveness. Herd studies (deer and chamois) are also under way for determination of herd structure, range, productivity, behaviour, forage habits etc., and it is thought that this work will produce facts applicable over a far greater extent of country. *Author's summary.*

14. Systematic Zoology

See also No. 4266.

145.7. Insecta. Entomology

See also Nos. 4266, 4274 *et seq.*, 4709 *et seq.*

3675. MILLER, D. *Bibliography of New Zealand Entomology 1775-1952 (with annotations).* *Bull. Dep. sci. industr. Res. N.Z.* No. 120, 1956. pp. 492. More than 3000 refs. Price 20s.

3676. DUMBLETON, L. J. *The New Zealand Aleyrodidae (Homiptera: Homoptera).* *Pacif. Sci.* 11 (2), 1957 (141-60). 14 refs. E.M.B.

Keys to and descriptions of 10 species. Food plants include *Pittosporum eugenioides*, *Melicactus ramiflorus*, *Nothofagus menziesii*, *Coprosma lucida*, *Wintera colorata*, *Eucalyptus globulus* and other trees and shrubs.

3677. BROUSSIER, M. La différenciation sexuelle au stade larvaire chez *Rhyacionia (Evetria) resinella* L. (Tortricidae). [Sexual differentiation in larvae of *R. resinella*.] *Bull. Inst. agron. Gembloux* 24 (4), 1956 (533-5). 3 refs. [F.] E.M.B.

Male larvae can be distinguished from the female by a grey-black spot situated between the 4th and 5th abdominal segments.

3678. GERE, G. *Investigations into the laws governing the growth of Hyphantria cunea Drury caterpillars.* *Acta biol., Budapest* 7 (1), 1956 (43-72). 9 refs. [E.e.russ.g.] O.R.S.

Changes with age in weight and in length and width of the head of larvae fed on leaves of *Acer negundo* are shown in graphs and tables.

3679. GARDINER, L. M. *Collecting wood-boring beetle adults by turpentine and smoke.* *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (1), 1957 (2).

Successful experiments have been made in collecting live adult beetles for research purposes (usually a time-consuming operation) by placing pans of turpentine ca. 4 ft. from the ground near a good landing surface. Large numbers of beetles of many species are attracted in this way. Another successful attractant is a fire of Pine chips, Spruce gum and coniferous foliage in a metal bucket. Both methods were successful in an area at least a mile from any recent felling and where there had been no fire or windthrow to provide breeding sites for large borer populations. The reaction to smoke appears to explain the huge populations of borers found in areas devastated by fire.

3680. BALCELLS R., E. Estudio ecológico de los crisomélidos del aliso. [Ecological study of the Chrysomelidae of Alder.] *Publicaciones del Instituto de Biología Aplicada, Barcelona* 20, 1955 (47-61). 15 refs. [Span.span.e.] I.I.E.

Studies the biology of *Chrysomela aenea* and the influence of temperature upon its life cycle, and also the development and geographical distribution of *Agelastica alni* in relation to temperature, with a comparison of the life cycle of the two.

3681. HEQVIST, K.-J. Zur Biologie von *Hylobius piceus* De G. [The biology of *H. piceus*.] *Anz. Schädlingssk.* 30 (4), 1957 (54-6). 10 refs. [G.]

3682. CHAPMAN, J. A. *Flight muscle change during adult life in Scolytidae.* *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (1), 1957 (3-4).

The author's recent observation of the change undergone in the flight muscles of *Trypodendron lineatum* during the brood-establishment period [cf. *F.A. 17* No. 3610] led him to make a study of other scolytids. Similar changes were found in adults dug from galleries, belonging to the genera *Dendroctonus*, *Dolurgus*, *Dryocoetes*, *Gnathotrichus*, *Hylurgops*, *Ips*, *Phloeosinus*, *Pseudohylesinus* and *Scolytus*.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 3674, 4267-73.

3683. SMITH, R. L. *An evaluation of conifer plantations as wildlife habitat.* *Abstr. of theses, in Dissert. Abstr.* 17 (3), 1957 (465-6). O.R.S.

Sixty plantations involving 10 conifer species in pure and mixed plantings and including various height and age classes, acreages, and edge conditions were studied. Deer showed a strong preference for Pine in winter but in summer frequented all plantations. Spruce proved the most effective cover for rabbits and grouse in winter, because of the tent-like shelters created by the lower branches under snow. Spruce, and mixed plantings containing Spruce, had the highest, and Pines the lowest density and variety of bird populations. The abundance of small mammals in plantations over 20 ft. high was influenced by ground cover. Plantations of > 10 acres support a greater variety and higher density of wildlife than smaller ones, use of which depends on adjacent cover. Management suggestions based on these findings are made. Chi-square tests of the deviations of numbers and weights of earthworms from their means, indicated heterogeneous populations in all study areas, differences being associated partly with differences in organic matter, cover and moisture. A Pine plantation on medium limy soil contained an average of 19 earthworms per plot (1 yard square) compared with 8.5 in an old-field habitat and 0.2 in a Pine plantation on limy soil.

3684. WILLIAMS, O. *The food of mice and shrews in a Colorado montane forest.* *University of Colorado Studies Series in Biology, Boulder* No. 3, 1955 (109-14). 6 refs. O.R.S.

The stomach contents of 8 species of mice and shrews found in 7 different types of plant community were analysed. No correlation was found to exist for any species between its food habits and the herbaceous and shrub vegetation characterizing the plant community that formed its preferred habitat. In the stomach of *Peromyscus maniculatus rufinus* trapped in a stand of Lodgepole Pine, the % of seed increased considerably between July and September. The microtines (*Phenacomys intermedius intermedius*, *Clethrionomys gapperi galei*, *Microtus mordax*, and *M. montanus fuscus*) all appeared to confine themselves to seeds and vegetative parts of plants for food. The data, however, were insufficient for general conclusions, and further study is needed.

3685. FRÖHLICH, J. *Wald und Wild im Urzustand.* [Forest and game in the natural state.] *Allg. Forstztg.* 66 (15/16), 1955 (192-3). [G.]

On the basis of his experiences and that of owners of shoots in the S. and E. Carpathians, the author estimates that in the large unexploited forests of the region, red deer were kept down to 2-4 head per 1000 ha., chiefly by large predators. When early clear fellings provided additional pasture, and bears and wolves were controlled, numbers soon increased so as to cause severe damage.

16. General Botany

160. Plant Chemistry

See also Nos. 3647-8, 3656, 3697, 3774, 3775, 3787, 4567 *et seq.*, 4711, 4771 *et seq.*

3686. ASHWIN, P. M., and RITCHIE, J. A. **Determination of magnesium in plant ash.** *N.Z. J. Sci. Technol.* 38B (5), 1957 (447-50). 2 refs. P.R.

Interfering elements are masked by addition of cyanide and triethanolamine, Ca is precipitated as oxalate, and Mg is titrated with disodium ethylenediaminetetraacetate dihydrate in the presence of the Ca oxalate precipitate, using solochrome black indicator. The method is rapid and accurate within 1%. *From authors' summary.*

3687. GEORGE, J., and KOHLI, R. C. **Nitrogen content of the leaves of some Indian trees.** *Indian For.* 83 (4), 1957 (287-8).

Gives tabulated results of tests on 40 species (N% and ash %).

3688. HASEGAWA, M., NAKAMURA, H., and TSURUNO, S. [The flavonoids from the leaves of gymnosperms (1). Catechin and flavonoids in the leaves of *Chamaecyparis pisifera*.] *J. Jap. For. Soc.* 37 (11), 1955 (488-91). 8 refs. [Jap.e.e.]

Presents results of paper-chromatographic analyses of (1) the foliage of *C. pisifera* and (2) other gymnosperms; *d*-catechin, quercitrin and distylin (*dl*-taxifolin) have been isolated from (1), and ginkgetin and its homologues detected in the foliage of all gymnosperms except Pinaceae. *From authors' summary.*

3689. PLOUVIER, V. Sur la recherche de pinitol chez quelques Caryophyllacées, Magnoliacées et plantes de familles voisines. [Pinitol in some Caryophyllaceae, Magnoliaceae and related families.] *C.R. Acad. Sci., Paris* 244 (3), 1957 (382-5). 3 refs. [F.f.] O.R.S.

Species containing pinitol included *Magnolia campbelli*, *M. kobus* and *M. parviflora*. Those lacking it included *Liriodendron tulipifera*, *L. chinense*, and *Cercidiphyllum japonicum*.

3690. TURNBULL, J. H., *et al.* **Nyctanthic acid, a constituent of [seeds of] *Nyctanthus arbor-tristis*** Linn. *J. chem. Soc. Feb.*, 1957 (569-73). 22 refs. O.R.S.

3691. KIRBY, K. D., and SUTHERLAND, M. D. **Some naturally occurring dimethylchromenes. II. Alloeovodione.** *Aust. J. Chem.* 9 (3), 1956 (411-5). 10 refs. O.R.S.

A substance isolated from leaves of *Evodia elleryana* was shown to be alloeovodione; 3 samples of leaves examined showed variation in chromene

content. Leaves of *E. bonwickii* were free from neutral chromenes. Tabulated data on the occurrence of chromenes in other Rutaceae are given.

3692. HILLIS, W. E. **The anthocyanins of the leaves and young bark of *Eucalyptus sieberiana* F. Muell.** *Repr. from Aust. J. Chem.* 9 (4), 1956 (544-6). 7 refs. [Cf. F.A. 18 No. 2468.]

3693. NIELSEN, N., and HOLMSTRÖM, B. **On the occurrence of folic acid, folic acid conjugates and folic acid conjugases in pollen.** *Acta chem. scand.* 11 (1), 1957 (101-4). 10 refs. [E.e.] O.R.S.

[Cf. F.A. 18 No. 81.] Species examined included *Pinus contorta* and *P. mugo*, *Picea glauca*, *Alnus glutinosa* and *A. incana*, *Betula alba* and *Fagus sylvatica*. Folic acid content ranged from 0.42 to 2.2 µg/g. pollen, and that of folic acid conjugates was considerably higher. Folic acid conjugases were present in pollen of *Pinus mugo*.

3694. YAMAZAKI, T., and TAKEOKA, M. [Fundamental studies on the fossilization of pollen. (1) On the chemical composition of Himalayan Cedar pollen.] *Scientific Reports of the Saikyo University (Agriculture)*, Kyoto No. 8, 1956 (17-9). 10 refs. [Jap.e.e.]

In general composition, pollen of *Cedrus deodara* was found to resemble that of *Pinus densiflora* and *P. thunbergii*, galactan and mannan being present in larger amounts than other polysaccharides. *From authors' summary.*

161. Physiology

See also Nos. 3712, 3721, 3767 *et seq.*, 3985, 3990-1.

3695. SLATYER, R. O. **Absorption of water from atmospheres of different humidity and its transport through plants.** *Aust. J. biol. Sci.* 9 (4), 1956 (552-8). 9 refs. O.R.S.

In experiments using 1-year seedlings of *Pinus echinata*, plants were arranged so that the top and roots were sealed in separate flasks, with vapour pressure in the flasks maintained at predetermined levels, so that diffusion gradients were set up favouring water movement from roots to top (positive transport) or from top to roots (negative transport). Results are tabulated, and show that moisture was absorbed from one flask and transferred through the plant to the other, both by positive and negative transport. Absorption occurred from both saturated and unsaturated atmospheres. The significance of these results for natural conditions is discussed.

3696. HUBER, B., and PLANKL, L. **Der jahreszeitliche Gang des Transpirationsstromes als Grundlage der Lebendrönkung von Waldbäumen. [The yearly course of the transpiration stream as a basis for the impregnation of living trees.]** *Forstwiss. Cbl.* 75 (9/10), 1956 (350-7). 31 refs. [G.]

The course of the transpiration stream in Spruce, Pine and Beech was measured by thermo-electric methods from February to November inclusive, in order to find the best time of year for impregnating standing trees. A sap flow of at least 0.5 m/hr. can be counted upon in conifers from mid-April to mid-September, and after flushing in Beech. In all

3 species, rates of > 1 m./hr. were most often found in August. From the end of June to the middle of July a retardation occurs, associated with the change-over from the growth to the storage period. At this time, as also in bad weather, it is advisable to hold up impregnation operations.

3697. GEROLA, F. M., and BARBESINO, M. L'attività deidrogenasica del cambio in differenti periodi dell'anno in *Corylus*, *Populus* e *Prunus*. [The dehydrogenase activity of the cambium at different seasons of the year in *Corylus*, *Populus* and *Prunus*.] *Nuovo G. bot. ital. (n.s.)* 63 (1), 1956 (37-45). 37 refs. [It. it. e.] A.P.B.

Using a tetrazolium staining technique, seasonal changes in dehydrogenase activity were determined in the cambium and phloem of branches of *C. avellana*, *Populus nigra* var. *italica* and *Prunus avium*. Maximum activity occurred in spring and autumn, coinciding with maximum cambial cell activity and maximum accumulation of reserves respectively. A gradient of activity was found along the branch, reaching a maximum at the apex.

3698. JACQUIOT, C. Sur l'existence de facteurs d'organisation des tissus secondaires chez certains arbres forestiers. [The existence of growth organizing factors in secondary tissue of some forest trees.] *C.R. Acad. Sci., Paris* 244 (9), 1957 (1246-9). 3 refs. [F.f.] O.R.S.

The fact that both cambium cultivated *in vitro* and cambium from a fresh stump produce very similar un-organized tissue, suggests that the organization of secondary tissue depends on chemical factors originating in the crown.

3699. BUVAT, R. Variations saisonnières du chondriome dans les cellules parenchymateuses du phloème de *Robinia pseudoacacia*. [Seasonal variations of the chondriome in parenchyma cells in the phloem of *R. pseudoacacia*.] *C.R. Acad. Sci., Paris* 243 (25), 1956 (2127-30). 1 ref. [F.f.] O.R.S. [Cf. *F.A.* 18 No. 1296.]

3700 BURR, H. S. Effect of a severe storm on electric properties of a tree and the earth. *Science* 124 (3233), 1956 (1024-5). O.R.S.

Report on a pilot experiment made in Lyme, Conn., in 1956; two reversible non-polarizable Ag/AgCl electrodes were embedded (a) in the cambium of the long axis of a tree and (b) in the moist earth. Photo-electric records were examined for the period before and after a severe storm. The standing potential of (b) oscillated for 4-5 hours before the storm, then the positive potential of the S. electrode dropped and became a negative potential of 20 or 30 millivolts. As the storm passed, this process was reversed and the relatively steady standing potential reappeared as a positive potential of 60 millivolts. In the next 3-4 hours the magnitude of this potential dropped to that characteristic of the early hours of the day. A similar change occurred in the potentials of (a) before the storm, with the development of a reversed polarity paralleling that in the earth. It is hoped to continue these studies, including the E.-W. as well as the N.-S. potentials.

3701. Instruments installed to learn heartwood temperature. *Rep. Calif. For. Range Exp. Sta., 1956*, [1957] (44-5).

Preliminary results from instruments in a living White Fir 36 in. in diam., in the Sierra Nevada, showed that internal temperature responded only slowly and slightly to air temperatures; e.g. when air temperatures ranged from 62 to 100° F., heartwood temperature ranged only from 62 to 64°.

162. Pathology. Teratology

3702. PAUL, B. H. Double branch whorls in White Pine. *For. Sci.* 3 (1), 1957 (71-2).

Describes an unexplained double whorling in planted *P. strobus*, derived from the growth, in the same season, of a second leader, sometimes < 1 in. long, and resulting in up to 20 branches at one node. In the interests of timber quality and pruning, its relation to heredity or climatic factors needs to be determined.

164. Morphology

3703. CAMEFORT, H. L'apex caulinaire des gymnospermes. [The shoot apex in gymnosperms.] *Année biol.* 32 (9/10), 1956 (401-16 + 2 plates). 50 refs. [F.] O.R.S.

Discusses the structure and functions of different zones of the growing point.

3704. PRICHARD, E. C. Morphological studies in *Rhamnaceae*. *J. Elisha Mitchell sci. Soc.* 71 (1), 1955 (82-106). 28 refs. L.S.

Twelve species are studied, representing the main tribes of the family: *Zizyphus jujuba*, *Berchemia scandens*, *Rhamnus caroliniana*, *R. frangula*, *Ceanothus americanus*, *C. divaricatus*, *C. lemmonnii*, *C. ovatus*, *C. cordulatus*, *C. foliosus*, *Colletia crenata* and *Gouania conzattii*.

3705. FACEY, V. Abscission of leaves in *Picea glauca* (Moench) Voss and *Abies balsamea* L. *Proceedings, North Dakota Academy of Science, Grand Forks* 10, 1956 (38-43). 6 refs. L.S.

In both species the actual abscission under drying conditions was due to mechanical breaking of cell walls in a region above a protective ligno-suberized layer which remained on the twig. No chemical changes in cell walls were found. A one-cell, anatomically differentiated abscission layer was found in *P. glauca* but not in *A. balsamea*.

3706. PODHORSKI, I. Slika poprečnih presjeka peteljke lista u nekih vrsta lisnatog drveća i grmlja. [The petiole cross-section of some broadleaved trees and shrubs [as a means of identification].] *Šum. List* 80 (11/12), 1956 (369-75). [Croat.f.]

Indicates the feasibility of this method of identification. Sections $\frac{1}{4}$ - $\frac{1}{2}$ mm. thick are placed on a glass plate and viewed by means of a magnifier $\times 8$ -10; it is advisable to stain with a 7% solution of phloroglucinol in alcohol, with subsequent addition of HCl. To prevent their drying, the petioles are stored in a 1/1/1 mixture of water, alcohol and glycerin.

3707. MAGGS, D. H. A photometer for estimating the area of samples of detached leaves. *Rep. E.*

Malling Res. Sta. 1955/56, 1957 (107-8). 2 refs.

An instrument is described which estimates photo-electrically the area of 100-400 sq. cm. of detached leaves. Its accuracy is assessed. *Author's summary.*

3708. YAMAZAKI, T., and TAKEOKA, M. [On the identification of the pollen of *Taxodiaceae*.] *Scientific Reports of the Saikyo University (Agriculture)*, Kyoto No. 8, 1956 (10-6). 8 refs. [Jap.e.e.]

Modern and fossil pollen of 7 genera was examined microscopically and compared with drawings, illustrating the differences. It is concluded that genera can be identified but that studies on individual species are needed. *From authors' summary.*

3709. SINGH, T. C. N., and NATARAJAN, A. T. Morphology of the pollen grains of the constituents of the Mangrove vegetation. *Abstr. in Proc. 40th Indian Sci. Congr., Lucknow 1953, 1954* (99-100). C.G.B.

Species discussed in the full paper are: *Rhizophora mucronata*, *Sonneratia apetala*, *Lumnitzera racemosa*, *Aegiceras majus*, *Avicennia officinalis*, *Acanthus ilicifolia* and *Excoecaria agallocha*.

3710. ISELY, D. Observations on seeds of the Leguminosae: Mimosoideae and Caesalpinioideae. *Proc. Iowa Acad. Sci.* 62, 1955 (142-9). 7 refs. L.S.

Discusses their gross morphology and provides a key for the identification of seeds of 18 species.

165. Phylogeny, Evolution. Heredity, Genetics and Breeding: Variation

See also Nos. 3650, 3764, 3768, 3852, 3930-6, 3941-4, 3988, 4252, 4254, 4257.

3711. WRIGHT, J. W. A bibliography on forest genetics and forest tree improvement, 1955. *Sta. Pap. Nttheast. For. Exp. Sta.* No. 90, 1957. pp. 60.

Contains 717 references, mainly to N. American, European, and Japanese works, arranged alphabetically by author and with a subject index.

3712. LICHTHE, H.-F. Über die Physiologie von Angiospermenpollen und ihre Bedeutung für die Pflanzenzüchtung. [The physiology of angiosperm pollen and its significance in plant breeding.] *Angew. Bot.* 31 (1/2), 1957 (1-28). 55 refs. [G.g.] E.M.B.

Discusses the physiology, germination and longevity of pollen of different species, including a number of trees, and presents some data on preservation methods and factors necessary for germination.

3713. KRIEBEL, H. B. Some analytical techniques for tree race studies. *Proc. Soc. Amer. For.* 1956, 1957 (79-82). 10 refs.

Several different techniques are described for analysing patterns of geographic variation in trees. These include both statistical and graphical methods of analysing a variety of responses. In selecting a method, the possibility must be considered that variation may be either continuous or discontinuous, and an attempt should be made to avoid forcing results into one or other type without testing the nature of the variation. *From author's summary.*

3714. JOHNSON, H., PERSSON, A., and ERIKSSON, G. Tallens rastyp i Sydsverige. [Phenotypes of Pine in S. Sweden.] *Svenska Skogsvärdn. Tidskr.* 54 (1), 1956 (47-60). 9 refs. [Sw.]

Each of the major divisions into plus, normal and minus stands for the purpose of seed collection is defined and subdivided into two classes. Maps are given showing the distribution of minus, and normal I and II stands in S. Sweden (plus stands are absent), and districts with stands in the different classes are listed, county by county. The best stands (normal class I) are found mainly in the east.

3715. EHRENBURG, C. E., and SIMAK, M. Flowering and pollination in Scots Pine (*Pinus silvestris* L.) *Medd. SkogsforsknInst., Stockh.* 46 (12), 1957. pp. 27. 23 refs. [E.e.sw.] Price Kr.2.

Describes results of experiments on (1) the best period for isolating ♀ flowers in breeding and (2) the capacity of trees for self-fertilization and for developing cones without pollination.

3716. KOBENDZA, R. Mieszkańce naturalne olszy szarej i czarnej w Polsce (*Alnus incana* Moench. × *A. glutinosa* Gaertn. = *A. hybrida* Alex. Braun). [Natural hybrids of *A. incana* × *A. glutinosa* (= *A. hybrida*) in Poland.] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 11, 1956 (133-49). 4 refs. [Pol.pol.russ.e.]

3717. GRAVES, A. H. Chestnut breeding—report for 1955 and 1956. *Rep. Nth. Nut Growers Ass.* No. 47, 1956 (99-110). E.M.B. [Cf. F.A. 17 No. 2477.]

3718. URQUIJO LANDALUZE, P., and SANTA OLALLA AZPILICUETA, G. Servicio de producción de castaños resistentes. [Service for the production of disease-resistant Chestnuts.] *Anales Instituto Nacional de Investigaciones Agronómicas, Madrid* No. 4, 1955 (733-7). [Span.] A.P.B.

A report on work carried out in 1954 in hybridization, selective breeding for resistance to ink disease, grafting and the induction of rooting by means of growth substances.

3719. PRYOR, L. D. *Eucalyptus* genetics. *Final Rep. World Eucalyptus Conf., Rome 1956*, 1956 (110-5). [E.]

Discusses inheritance of characters, the breeding system, inter- and intraspecific hybridization (natural and artificial), vitality of offspring, and vegetative propagation.

3720. PRYOR, L. D. Selecting and breeding for cold resistance in *Eucalyptus*. *Silvae Genet.* 6 (3/4), 1957 (98-109). Many refs. [E.e.f.g.]

Discusses taxonomy and clinal variations in *Eucalypts*, general problems of breeding *Eucalypts*, hybridization, the inheritance of characters, and experience to date in vegetative propagation; and outlines briefly a programme for breeding cold-resistant species.

3721. CONTARDI, H. G. Variabilidad en *Eucalyptus rostrata*. [Variability in *E. rostrata*.] *Revista de la Facultad de Ciencias Agrarias, Universidad Nacional de Cuyo, Mendoza* 4 (1), 1954 (47). [Span.] C.G.B.

Wide variations in resistance to drought and low temperature and in osmotic pressure were noted in a plantation in San Juan province, Argentina. Further observations on variations in osmotic pressure are being carried out.

3722. KOPECKY, F. Feketenyárnemesítésünk kérdései. [Problems of Black Poplar breeding in Hungary.] *Erdész. Kutatás., Budapest* 1956 (1), (17-32). 8 refs. [Hu.russ.e.g.]

Introduced longer-day Poplars cease annual growth earlier than local species and hybrids. Better results in early growth are shown by hybrids and inter-racial crosses of *P. nigra*. Its long growing-season character cannot be combined genetically with the fast early growth of the Balsam Poplars. Crossing it with vigorous-rooting species gives hybrids the cuttings of which show improved rooting. The progeny of the Aspen, whose cuttings root with difficulty, can be similarly improved. Light-period demand, both natural and acquired, is transmitted to the progeny like other genetic characters. The crossing of the sections *Leuce* and *Aigeiros* produces dwarfed or stunted progeny.

3723. TEMPLIN, E. Prüfung der Anfälligkeit verschiedener Pappelsorten, -klone und -hybriden gegenüber Schädlingen aus der Insektenwelt. [Tests of the susceptibility to insect attack of different Poplar varieties, clones and hybrids.] *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie, Berlin* 1954, 1955 (73-83). 12 refs. [G.] I.I.E.

Gives details of methods used in an experiment at the Eberswalde Institute. Wire cages 10 × 10 × 2 m. were erected in the field to cover 1- to 2-year-old plants. Insect species with stages of development and patterns of injury easily distinguishable from one another were selected for release in the same cage. Factors considered in selecting sites, establishing controls and methods of assessing the degree of attack are described and some preliminary results given.

3724. SCHÖNBACH, H. Untersuchungen über Cellulosegehalt und Raumgewicht von Pappelhölzern im Rahmen der Züchtung. [Cellulose content and density of Poplar wood in the context of breeding.] *Wissenschaftliche Abhandlungen, Deutsche Akademie der Landwirtschaftswissenschaften, Berlin* No. 16 (Beiträge zur Pappelforschung No. 1), 1956 (9-38). 23 refs. [G.g.]

Describes studies already reported [see *F.A.* 17 No. 1255] and gives also some preliminary data on wood density for the same genetical material. No correlation was found between oven-dry density and cellulose content, but wood of some clones of × *P. berolinensis* tended to show high values for both, and this hybrid, despite its liability to disease in later years, is tentatively recommended as a short-rotation pulpwood crop.

3725. De veredeling in de bosbouw in Nederland. [Tree breeding in forestry in the Netherlands.] *Ned. Boschb.-Tijdschr.* 29 (3; 4), 1957 (53-81; 91-121). [Du.e.]

Republishes the following papers, all with English summaries, read at a study circle at Oosterbeek in

Feb. 1957: Genetics and forest tree breeding (*G. Houtzagers*); The use of vegetative propagation in forest tree breeding (*L. E. Broekhuizen-van Straaten*); Selection of Poplars of the *Aigeiros* group (*J. T. M. Broekhuizen*); Selection and breeding of *Leuce*-group Poplars at the Bosbouwproefstation T.N.O. (*G. Hellinga*); Research on resistance (to insects and disease) in forest tree improvement (*H. van Vloten*); Breeding Elms in the Netherlands (*H. M. Heybroek*); Research on Poplar canker caused by *Pseudomonas syringae* f.sp. *populea* (*G. van den Ende*); and The work of the Foundation for the Improvement of Forest Tree Crops (*E. C. Jansen*); and a report on the meeting by *A. van Laar* and *G. Hellinga*.

3726. MERGEN, F., and NOVOTNY, H. M. Squash technique for chromosome studies in Pine needles and root tips of Slash Pine [*P. elliotii* Engelm.]. *For. Sci.* 3 (1), 1957 (56-60). 8 refs.

Indicates, for a study of polyploidy induction, the best time and conditions for the collection of the material, a schedule of recommended techniques and a table of average chromosome-configuration frequencies, derived from various colchicine pre-treatments; that of 1% strength for 60 minutes proved to be the optimum for the production of the largest number of chromosomes in the metaphase condition.

3727. MUKHERJEE, S. K. Cytology of some Malayan *Mangifera*. *Abstr. in Proc. 40th Indian Sci. Congr., Lucknow* 1953, 1954 (134-5). C.G.B.

The chromosome number, morphology, and pollen morphology of *M. foetida* and *M. caesia* are similar to those of *M. indica*. This suggests that close compatibility may be expected during interspecific hybridization between these and the common Mango.

166. Economic Botany (General)

See No. 3734.

168. Histology

See section 811 and Nos. 3698, 3703, 3705-6, 4169, 4571-3.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See also Nos. 4205 *et seq.*, 4689 *et seq.*

3728. DOMNIK, T. Huby. [Polyporaceae.] Państwowe Zakłady Wydawnictw Szkolnych, Warszawa. 1957. pp. 160. 21 refs. [Pol.] Price Zł.8-10. X.

Includes sections on: (1) economic importance and use of Polyporaceae; (2) their use in medicine; (3) their morphology; (4) a 'dichotomous' identification key; (5) their systematics; (6) identification key for families, subfamilies and genera according to Pilat, and a key for identifying genera commonly accepted in popular scientific literature; (7) brief descriptions of the common genera and species; with alphabetical indexes of Latin and Polish names.

3729. WATERHOUSE, G. M. [Compiler]. *The genus **Phytophthora**: diagnoses (or descriptions) and figures from the original papers.* Misc. Publ. Commonwealth. mycol. Inst. No. 12, 1956. pp. 120. Price 15s.

Includes a few species parasitic on trees.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also No. 3848.

3730. KAYACIK, H. Belgrad ormanı florası. [The flora of Belgrad forest.] *Istanbul Üniv. Orm. Fak. Derg.* 5A (1/2), 1955 (77-90). 9 refs. [Turk.e.e.]

Meteorological data and a first plant list are given for this 5000-ha. forest, a relic of the forests formerly surrounding Istanbul, now used as the instructional forest for the University's faculty of forestry.

3731. STEWART, R. R. *Parker's Forest Flora. Pakistan J. For.* 7 (1), 1957 (8-19). 3 refs.

Additions and corrections to this standard work on the forest flora of the Punjab.

3732. SANTAPAU, H., and RAIZADA, M. B. Contribution to the flora of the Gir forest in Saurashtra. *Indian For. Rec. (n.s.) Botany* 4 (6), 1955 (1956), (105-70 + 1 photo + 2 sketch-maps).

3733. EXELL, A. W., and MENDONÇA, F. A. *Conspectus florae angolensis elaborado pelo Instituto Botânico de Coimbra com a colaboração do Museu Britânico (British Museum) fundado por Dr. L. W. Carrisso. Vol. II, Fasc. II. [Balsaminaceae], Leguminosae (Caesalpinioideae-Mimosoideae). [Conspectus florae angolensis, prepared by the Botanical Institute of Coimbra with the collaboration of the British Museum, work initiated by Dr. L. W. Carrisso. Vol. II, Fasc. II. [Balsaminaceae], Leguminosae (Caesalpinioideae-Mimosoideae).] Junta de Investigações do Ultramar, Ministério do Ultramar, Lisboa, 1956. pp. 153-322 + 1 map. [Port.] [Cf. F.A. 16 No. 137.]*

3734. Las plantas cultivadas en la República Argentina. [Plants cultivated in Argentina.] Instituto de Botánica Agrícola, Ministerio de Agricultura y Ganadería, Buenos Aires, 1951-1956. [Span.]

Further parts [cf. F.A. 15 Nos. 3275-81] dealing with: Vol. 1 (Fasc. 20) Cephalotaxaceae (W. H. G. Barrett; pp. 12); 1 (22) Taxodiaceae (M. J. Dimitri; pp. 23); 4 (52) Juglandaceae (M. J. Dimitri and V. A. Milano; pp. 21); 7 (120) Rhamnaceae (A. Marzocca and C. E. M. Marthi; pp. 48); 7 (123) Tiliaceae (M. J. Dimitri and F. Rial Alberti; pp. 46); 8 (133) Flacourtiaceae (M. J. Dimitri and F. Rial Alberti; pp. 16); 8 (148) Araliaceae (M. J. Dimitri and V. A. Milano; pp. 20); 9 (162) Loganiaceae (V. A. Milano; pp. 16); Apocynaceae (A. Marzocca; pp. 68).

174.2/7. Gymnosperms

See also No. 3708.

3735. YATOH, K.-I. Conifers of the Kii peninsula (IV). Repr. from *Bulletin, Faculty of Agriculture,*

Mie University, Tsu No. 14, 1957 (111-20 + 8 plates). 10 refs. [E.Jap.]

[Cf. F.A. 18 No. 2524.] *Taxus cuspidata*, *Abies veitchii*, *Tsuga sieboldii* and *T. diversifolia*.

3736. PAMAY, B. Türkiye ardıc (*Juniperus* L.) türleri ve yayılışları. [Turkish species of *Juniper* and their distribution.] *Istanbul Üniv. Orm. Fak. Derg.* 5A (1/2), 1955 (91-120 + 20 photos, and 6 maps). 34 refs. [Turk.f.]

The annual cut of Junipers is only 2-3 thousand cu.m. from a growing stock of about 5.52 million cu.m. Descriptive notes (dimensions, ecology, associates), locality lists, maps of distribution in Turkey and photographs are given of *Arceuthos* (*Juniperus*) *drupacea*, *J. oxycedrus*, *J. nana*, *J. foetidissima*, *J. excelsa*, and *J. phoenicia*. The last three, in the order given, contribute most to the growing stock and are the only ones of commercial importance.

3737. ANLIKER, J. Zur Unterscheidung von *Pinus sabiniana* Dougl. und *P. coulteri* Don. [Distinguishing *P. sabiniana* from *P. coulteri*.] *Schweiz. Beitr. Dendrol.* No. 7, 1955 (1956), (14-23). 14 refs. [G.]

Includes a key to the principal morphological characters.

3738. MERENDI, A. Il pino domestico (*Pinus pinea* L.). [*P. pinea*.] *Ital. agric.* 94 (1), 1957 (65-76). [It.] E.M.B.

An account of the species, its silviculture, protection, and management (for edible seeds as well as for timber).

176.1. Dicotyledons

See also Nos. 3706, 3709-10, 3716, 3760, 3764.

3739. ECKARDT, T. Zur systematischen Stellung von *Eucommia ulmoides*. [The systematic position of *E. ulmoides*.] *Ber. dtsch. bot. Ges.* 49 (10), 1956 (487-98). 41 refs. [G.g.] O.B.D.

3740. BUGAŁA, W. Topole północno-amerykańskie sekcji *Aigeiros* Duby i ich wpływ na uprawę topoli w Europie. [North American Poplars of the section *Aigeiros* and their influence on the cultivation of Poplars in Europe.] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 11, 1956 (225-61). 30 refs. [Pol.russ.e.]

Describes *P. deltoides* (with vars.), *P. sargentii*, *P. texana*, *P. palmeri*, *P. fremontii*, *P. wislizenii*, *P. arizonica*, and *P. macdougalii*, with special reference to natural distribution, nomenclature, and the introduction of some of these species into Europe. *P. deltoides* var. *virginiana* [var. *monilifera*] exists in Poland only in botanic gardens, but grows well; *P. d.* var. *missouriensis* has only been introduced there since 1948. *P. sargentii*, *P. fremontii*, *P. wislizenii* and *P. palmeri*, all raised from American seed at the Kórnik Arboretum, have given only weakly plants that have succumbed to frost. Trees met with in Europe under the names *P. fremontii* and *P. wislizenii* are probably wrongly named; in most cases they are various hybrid Black Poplars.

3741. RISDAL, M. Om våre to eikarter—*Quercus robur* L. og *Quercus petraea* (Matt.) Lieblein—deres

systematikk og forekomst i Norge. [The Norwegian native Oak species, *Q. robur* and *Q. sessiliflora*: their characteristics and distribution in Norway.] *Medd. norske Skogforsøksv.* 12 (3), (No. 46), 1955 (225-77). 46 refs. [Nor.e.]

The morphological characteristics used in distinguishing the two species are described with illustrations. From an examination and statistical analysis of material from 1357 trees in different parts of Norway, it is concluded that the most reliable criteria for identification are nervation, shape of leaf base, and length of petiole, and, if fruiting material is available, length of fruiting peduncle and the presence or absence of lines on fresh, fully ripe acorns. The length of the style and shape of the stigma were also examined on material from 55 trees; the majority of trees of *Q. sessiliflora* had very short styles and distinctly incised stigmas; material from *Q. robur* was more variable and insufficient for conclusions to be drawn. Maps show the distribution of the two species, based on material from 2130 trees. *Q. robur* is the more common, *Q. sessiliflora* being abundant only in E. and W. Agder, in coastal areas. In S. Norway the altitudinal limit for *Q. robur* is ca. 550 m. and for *Q. sessiliflora* 450 m. The latter is found as far north as Modalen county, Hordaland, and the former in Edy county, Møre.

3742. MARTINEZ, M. Los encinos de México. VI [sic]. [The Oaks of Mexico. VI.] *An. Inst. Biol. Univ. Méx.* 27 (1), 1956 (19-47). [Span.] C.G.B. [Cf. *For. Abstr.* 18 No. 150.]

3743. MANNING, W. E. The genus *Juglans* in Mexico and Central America. *J. Arnold Arbor.* 38 (2), 1957 (121-50). 14 refs.

A taxonomic revision recognizing 7 species (*J. pyriformis*, *J. hirsuta* sp. nov., *J. mollis*, *J. major* (2 forms), *J. microcarpa* (1 var.), *J. olanchana* (1 var. nov.) and *J. steyermarkii*).

3744. SAMEK, V. Jasan na jižní Moravě. [Fraxinus in southern Moravia.] *Lesn. Práce* 35 (10), 1956 (469-70). [Cz.]

Includes a morphological key for identifying the following *Fraxinus* species encountered in S. Moravia: *F. excelsior*, *F. oxycarpa*, *F. ornus* and *F. americana*.

3745. SÉBASTIAN, C. Étude du genre *Phillyrea* Tournefort. [A study of the genus *Phillyrea*.] *Trav. Lab. for. Toulouse* 1 (5) Art. 27, 1956. pp. 100 + 11 dgms., 9 photos. 56 refs. [F.]

3746. KOSTERMANS, A. J. G. H. New and critical Malaysian plants. I & II. *Reinwardtia*, *Bogor* 2 (2), 1953 (357-66); 3 (1), 1954 (1-25). [E.] L.S.

(I) *Serianthes gigalobium* sp. nov. and *Mimosa invisa* var. *inermis* var. nov., *Schrebera kusnotoi* sp. nov., *Podocarpus palembanica*, *Pterocymbium splendens* sp. nov. and *Pterygota horsfieldii* comb. nov. (II) 14 new species and 3 new combinations of *Pithecellobium* with notes on some *Archidendron* spp. Some data on vernacular names, timber properties and uses are given for *P. rosulatum* (Borneo) and *P. tjendana* (Celebes) spp. nov.

3747. KOSTERMANS, A. J. G. H. New and critical Malaysian plants. III & IV. *Bagian Planologi Kehutanan, Djawatan Kehutanan Indonesia, Bogor.* 1955. pp. 31 + pp. 40. [E.jav.]

Describes new species, new combinations etc. in Anacardiaceae, Dipterocarpaceae, Guttiferae, Lauraceae, Lorantheae, Rosaceae and Sterculiaceae.

3748. LEENHOUTS, P. W. *Florae Malesianae precursores. XI. New taxa in Canarium. Blumea* 8 (1), 1955 (181-94). [E.] O.R.S.

Describes 22 new forms, varieties, subspecies and species.

3749. LAM, H. J. Revision of the Burseraceae of the Malaysian area in the widest sense. *Va. Haplobolus. Blumea* 8 (1), 1955 (175-80). [E.] O.R.S.

A supplement to a revision in 1953 [see *F.A.* 16 No. 154], adding *H. mollis* sp. nov. and *H. acuminata* f. *glabra* f. nov.

3750. CUATRECASAS, J. The American species of *Dacryodes* [Burseraceae]. *Trop. Woods* No. 106, 1957 (46-65).

Gives a key to 15 species (northern South America and eastern West Indies). One new combination, 7 new species and 2 new varieties are described.

3751. LÉANDRI, J. Euphorbiacées malgaches nouvelles récoltées par M. R. Capuron. [New Madagascar Euphorbiaceae collected by M. R. Capuron.] *Bull. Soc. bot. France* 103 (9/10), 1956 (604-8). [F.] O.B.D.

Includes descriptions of two new species—*Deuteromallotus capuronii* and *Suregada capuronii*.

3752. FERNANDES, A., and DINIZ, M. A. Contribuição para o conhecimento das Lythraceae de Moçambique. [The Lythraceae of Mozambique.] *Garcia de Orta, Lisboa* 4 (3), 1956 (385-408). [Port.f.]

A taxonomic study based on specimens in Portuguese and African herbaria [cf. *F.A.* 17 No. 3680].

3753. WILSON, K. A. A taxonomic study of the genus *Eugenia* (Myrtaceae) in Hawaii. *Pacif. Sci.* 11 (2), 1957 (161-80). 27 refs. E.M.B.

E. malaccensis, *E. jambos*, *E. sandwicensis*, *E. cumini*, *E. uniflora*, *E. rariflora*, *E. koolauensis*, and *E. molokaiana* sp. nov.

3754. SLEUMER, H. Studies in old world Proteaceae. *Blumea* 8 (1), 1955 (2-95). [E.] O.R.S.

Comprises the following sections: I. The genus *Grevillea* in Celebes. II. A survey of the genus *Macadamia*. III. The genus *Gevuina* in Australia and New Guinea. IV. A second species of the genus *Hicksbeachia*. V. A revision of the genus *Helicia*. VI. *Helicopsis*, a new genus of the Proteaceae-Grevilleae.

3755. KOSTERMANS, A. J. G. H. The genus *Firmiana* Marsili (Sterculiaceae). *Commun. For. Res. Inst., Bogor* No. 54, 1956, pp. 33. [E.e.]

Recognizes *Firmiana* and *Erythropsis* as congeneric and as linking *Sterculia* and *Scaphium*.

Describes 8 species, *F. colorata*, *F. diversifolia*, *F. hainanensis* sp. nov., *F. major*, *F. papuana*, *F. pallens* comb. nov., *F. philippinensis* sp. nov. and *F. platani-folia*, and refers 17 binomials to other genera. From author's summary.

3756. KOBUSKI, C. E. **Studies in the Theaceae, XXIX. Further studies in the genus *Melchiora*.** *J. Arnold Arbor.* 38 (2), 1957 (199-209).

The species are now reduced to two [cf. *F.A.* 17 No. 3689], *M. intermedia* being reduced to one of the 3 varieties of *M. schliebenii*.

18. Plant Ecology

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 3736, 3738, 4436, 4497, 4505-6, 4535.

3757. HARACSI, L. A boróka jelen tösege. [Importance of *Juniperus communis*.] *Erdő-mérnöki Főiskola Közleményei, Sopron* 1956 (1), (3-22). 25 refs. [Hu.hu.russ.g.]

J. communis is recommended as a useful soil-improving pioneer for heathland and sandy soils. It is undemanding, tolerating extremes of climate and soil, full sun and shade; it will provide shelter at forest margins and in windbreaks, and is useful for its wood and fruits.

3758. [Biological studies of *Larix gmelini* var. *principis-rupprechtii* and its varieties.] *For. Sci., Peking* 1 (1), 1955 (1-36). [Chin.]

An account in some detail of natural distribution, rate of growth, seeding and reproduction, root systems and timber properties. [Cf. *F.A.* 18 No. 3845.]

3759. FOWELLS, H. A., and SCHUBERT, G. H. Silvical characteristics of Sugar Pine [*Pinus lambertiana*]. *Tech. Pap. Calif. For. Range Exp. Sta.* No. 14, 1956, pp. 19, 42 refs.

A report, compiled from literature, on site conditions of *P. lambertiana*, its reproductive behaviour, seedling development, growth and yield, reaction to competition, and principal enemies.

3760. GLIŠIĆ, M. V. Planinski javor u Srbiji s osvrtom na njegovo korišćenje u šumsko-kulturnim radovima. [*Acer heldreichii* in Serbia and its suitability for afforestation work.] *Šumarstvo* 9 (10), 1957 (601-12). 24 refs. [Serb.e.f.]

A brief historical review is made of the taxonomy of *Acer heldreichii* and its subspecies, varieties, and forms, with a map showing its present distribution in Serbia. From literature supplemented by observations in 1954-55, an account is given of its localities and their floristics. This species is extremely hardy, occurring on sites at > 1000 m. alt. and preferring, though not restricted to, acid soils. It colonizes cleared or burnt areas and is recommended for introduction on poor sites from altitudes of > 1000 m. up to the tree limit.

3761. FUKAREK, P. Poljski jasen (*Fraxinus angustifolia* Vahl) i neke njegove šumsko uzgojene

osobine. [*F. angustifolia* and some of its silvicultural characters.] *Šumarstvo* 9 (6/7), 1956 (331-45). 19 refs. [Croat.e.f.]

The popular names of *F. angustifolia* are given. Its significance in Slavonian Oak forests is discussed with reference to past literature, and some observations are made on its biology.

3762. KADAMBI, K. *Vateria indica* Linn. *Indian For.* 83 (5), 1957 (317-23 + 2 photos). 24 refs.

Notes on silvicultural characters, artificial regeneration, increment, and uses.

3763. KRISHNASWAMY, V. S. *Broussonetia papyrifera* (Paper Mulberry). *Indian For.* 83 (5), 1957 (295-301). 8 refs.

Notes on silvicultural characters, increment, and utilization.

3764. MÉTRO, A. E. Problems basic to planting [of Eucalypts]. Round-up of research progress in the past five years and future needs. [With discussion.] *Final Rep. World Eucalyptus Conf., Rome* 1956, 1956 (19-27). [E.]

Briefly covers ecology—soil relations, nutrients, biotic factors; water relations; dendrology, identification, arboreta and field trials, genetics, and wood properties in relation to growth conditions.

181.1. Distribution, Natural Range

3765. KOLAROVICH, S. Prilog poznavanju nazališta Pančičeve omorike u N.R. Srbiji. [A site of *Picea omorika* in Serbia.] *Šumarstvo* 9 (10), 1956 (646-8). [Serb.]

Describes the finding of individual trees of *P. omorika*, with heights ranging from 1.20 m. to 12 m., near Mt. Galirik, Serbia, at altitudes of 1100 and 1240 m.

3766. TSCHERMAK, L. Die natürliche Verbreitung der Eichen in Österreich. [The natural distribution of Oaks in Austria.] *Forstarchiv* 27 (3), 1956 (60-6). 23 refs. [G.]

Deals with *Quercus pubescens*, *Q. cerris*, *Q. robur* and *Q. sessiliflora*.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 3720-2, 3788, 3795-8, 3801-2, 3874, 3905 et seq., 4166-72, 4844.

3767. KRAMER, P. J. Some effects of various combinations of day and night temperatures and photoperiod on the height growth of Loblolly Pine seedlings. *For. Sci.* 3 (1), 1957 (45-55). 19 refs.

The combinations, applied in greenhouses to seedlings in their 2nd growth season, showed that best height growth was made with the widest spread of day and night temperatures (12 or 13° C.), and the poorest when nights were as warm as day, a possible explanation of the better growth of the species at the northern limit of its range. The highest temperatures gave the most early-season, and the lower the most late-season growth. This latter occurred with the coolest night temperatures, suggesting that in nature it is the hot summer nights that initiate the cessation of seasonal growth. The

growth of seedlings under constant temperature and day-length showed the same seasonal course as in the open, but an 8-hour day shortened, and a 16-hour day lengthened, the growing season. Individual seedling growth is intermittent, with dormant periods of a few weeks.

3768. IRGENS-MOLLER, H. Ecotypic response to temperature and photoperiod in Douglas Fir. *For. Sci.* 3 (1), 1957 (79-83). 8 refs.

In a progress report on research on 2- to 6-year seedlings, to be continued with clonal material, a tentative hypothesis is presented that the Douglas Firs of high altitudes do not burst their buds until the days lengthen considerably, thereby avoiding injury from night-frosts at a period when the sunny days encourage new seasonal growth. Lowland Douglas, where daily temperature fluctuations are considerably less, do not show this influence of long photoperiod on the date of bud bursting. [Cf. *F.A.* 18 No. 2616.]

3769. WAREING, P. F., and ROBERTS, D. L. Photoperiodic control of cambial activity in *Robinia pseudoacacia* L. *New Phytol.* 55 (3), 1956 (356-66 + 6 photos). 28 refs. O.R.S.

When seedlings were kept in short-day conditions for some weeks after extension growth stopped, cambial activity of the stem also stopped, but if they were transferred to long-day conditions after extension growth stopped, cambial activity continued in about half the plants. Bark-ringing experiments showed that the cambial stimulus, apparently originating in the leaves, was carried in a basipetal direction in the stem. The maintenance of cambial activity in long-day conditions was not accompanied by detectable bud-growth. The new wood formed after extension growth had stopped was of the late-wood type; its vessels appeared to arise from the region where the leaf traces join the main vascular system of the stem. The significance of the results is discussed.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 3632, 3639-42, 3646-8, 3652, 3656, 3664, 3695, 3721, 3868, 3968, 4040 *et seq.*, 4109, 4174-5, 4367, 4430.

3770. JÁRÓ, Z. Czeméték hervadása különözö vízkötési talajokban. (Előzetes jelentés). [Wilting experiments with seedlings on soils of different water-retaining capacity. (Preliminary report).] *Erdész. Kutatás., Budapest* 1956 (1), (109-116). [Hu.russ.e.g.]

Soil moisture is critical for tree growth in Hungary. Seedlings of Pines, Oak, Poplar and Robinia were planted in pots of calcareous and acidic sands, meadow clay, brown forest soil, raw loess, and dolomitic and limestone rendzinas. The different species showed the same stages of wilting with nearly equal amounts of soil moisture in the same soils but Pines took 4-5 times as long to consume the same amount of water as broadleaved species. Pines were in general more sensitive to water deficiency and if wilting continued until soil moisture % was less than double the hygroscopicity value [see *F.A.* 16 No. 2741] and this continued for at least 48

hours, all died—a partial explanation of the death of Pines on unsuitable sites after long droughts.

3771. CLARK, J., and GIBBS, R. D. Studies in tree physiology IV. Further investigations of seasonal changes in moisture content of certain Canadian forest trees. *Repr. from Canad. J. Bot.* 35, 1957 (219-53). 33 refs.

Studies were made on the seasonal changes of water content in *Betula lutea* from 1949 to 1952. These were similar to those of *B. populifolia* and *B. papyrifera*. The moisture content of the sapwood and outer heartwood is depleted in (a) late winter and (b) late summer, the deficiency being more serious in (b), which is a period of low precipitation and heavy evapo-transpiration. It is not thought that the changes in m.c. support the view that Birch dieback is caused by an increase in temperature or by drought. Some data are also given on the water content of *Tsuga canadensis*, *Abies balsamea*, *Picea rubens*, and *Thuja occidentalis*. Loss by sinking may be lessened slightly if *A. balsamea* is felled in July and August, and *P. rubens* in July and October. *T. occidentalis* is expected to have good buoyancy all the year; *Tsuga canadensis* floats badly at all seasons.

3772. KR PAN, J. Sadržaj vode u sirovjoj bukovini. [Moisture content of green Beech wood.] *Šum. List.* 80 (11/12), 1956 (386-92). 4 refs. [Croat.croat.e.]

Samples were taken from discs sawn every 4 m. up the stems of 4 felled *Fagus sylvatica*, free of false heart, near Pakrac in Croatia. The moisture content (m.c.) was determined by weighing samples immediately after felling, drying (8 hours at 40-50°C., 8 hours at 60-70°, and then at 100° until constant weight was reached) and weighing again. The following mean values were found: m.c. 73.7 ± 15.9%; ring width 2.8 ± 1.3 mm.; oven-dry density 0.690 ± 0.033 g./cc. The maximum m.c. was found at mid-height; it was less at the butt than at the top end. Except for the butt, where the contrary was the case, the m.c. was greater at the periphery than in the centre, although the differences were not great. There was no marked difference in m.c. between the N. and S. sides of the stem.

3773. KAWADA, H., and TAKAMI, M. [On the Pine forest soils at the foot of Mt. Asama.] *J. Jap. For. Soc.* 38 (2), 1956 (54-62). 23 refs. [Jap.e.e.]

Typical soil profiles are described and illustrated and the relationship between quality and growth of *Pinus densiflora* on certain sites and the physical and chemical properties and depth of soil is discussed. *From authors' summary.*

3774. HOWARD, R. A., and PROCTOR, G. R. The vegetation on bauxite soils in Jamaica. *J. Arnold Arbor.* 38 (1; 2), 1957 (1-50; 151-69).

Part I gives transects and species lists of the grass and woodland succession on areas of open-cast bauxite mining. It is concluded that all the species seen are Al-tolerant and fail to indicate Al, which they do not accumulate. Part II gives a list of species (of > 90 families) growing on areas to be mined and on adjacent areas, or colonizing worked-out areas.

3775. RENNIE, P. J. The uptake of nutrients by timber forest and its importance to timber production in Britain. *Quart. J. For.* 51 (2), 1957 (101-5). 19 refs.

Summarizes the data already published by the author [cf. *F.A.* 17 No. 2540] and discusses their relevance to the policy of the Forestry Commission, particularly in the afforestation of *Calluna* heath soils.

3776. INGESTAD, T. Studies on the nutrition of forest tree seedlings. I. Mineral nutrition of Birch [*Betula verrucosa*]. *Physiol. Plant., Copenhagen* 10 (2), 1957 (418-39). 69 refs. [E.e.]

Birch seedlings were grown for 75 days in nutrient solutions with varying concentrations of N, P, K, Ca, Mg, S, or Fe. The composition of the control solution (in p.p.m.) was 140 N, 100 P, 175 K, 120 Ca, 48 Mg, 64 S, 2.8 Fe + trace elements. The results of the different concentrations of each element on the leaf and root contents (in % of dry weight), the total fresh and dry weight, and the stem length are given. The control seedlings showed the greatest growth, and for the conditions of the experiment the control concentrations were considered the most satisfactory (except for K and Mg, which were too high). Birch requires relatively large amounts of N and S, but it is less demanding of the other elements. The root/shoot ratio is related to the supply of N, S, and Fe, and it decreases as these elements increase. A table is given showing the leaf mineral content that indicates the best growth. Additional studies on the interaction between different elements revealed that inadequate supplies of K will bring about Fe deficiency and chlorosis.

3777. EIBERLE, K. Untersuchungen über den Einfluss der pH Reaktion auf das Austreiben und die Bewurzelung von Pappelstecklingen verschiedener Klone. [The influence of pH on the flushing, shoot development and root formation of Poplar cuttings of various clones.] *Schweiz. Z. Forstw.* 108 (4/5), 1957 (215-57 + 1 plate). 12 refs. [G.g.f.]

Five cuttings from each of 8 clones grown in a Zurich trial garden of *× P. serotina*, *× P. regenerata*, *× P. marilandica*, *P. candicans*, *P. 'Schrotzberg'* and 3 unnamed, were placed in tapwater adjusted for pH values of 2.4, 4.2, 6.0, 7.8, 9.6, and 11.4 by adding H_2SO_4 or NaOH, and kept under uniform temperatures and light (12 hours' artificial light for 44 days). Except for the lowest value, pH had no influence on the development and unfolding of leaves, and little influence on shoot growth. The effect on root development was much more marked, with an optimum for root formation and length at pH 6.0. *P. candicans* and an unnamed 'bog' Poplar showed the greatest vigour and adaptability. Clonal differences were most marked in the phases of flushing, and least in root development.

3778. OVERTON, J. D., and MADGWICK, H. A. I. Afforestation and soil reaction. *J. Soil Sci.* 8 (1), 1957 (141-9). 17 refs.

The pH of the leaves, litter and rooting horizons was recorded (6900 measurements) under comparable conditions in 13 unplanted and 100 forest plots,

17-50 years old, in 10 areas of England and Wales. Seventeen tree species, representing 83 plots, occur in more than one area. When arranged according to the increasing acidity of their underlying soils, these species appear in virtually the same sequence, the unplanted plots being least acid, thus: *Chamaecyparis lawsoniana* and *C. nootkatensis*, *Thuja plicata*, Beech, *× Larix eurolepis*, Sitka Spruce, Oaks, Norway Spruce, Scots Pine, Japanese Larch, *Pinus nigra*, *Betula alba*, *Alnus incana*, Grand and Noble Firs, Douglas Fir, *Pinus contorta*, *Tsuga heterophylla* and *Larix decidua*. Differences in the pH of open areas and adjacent forest plots show that afforestation modifies soil conditions. The maximum range of soil pH among species at one site was only ca. 0.5 pH units; it is slightly greater on alkaline soils. The greatest effect appears to occur in the first 25 years. There was no evidence of its later intensification and no sharp distinctions in effect can be shown by natural groupings, e.g. hardwoods and softwoods, indigenous and exotic. [Cf. *F.A.* 17 No. 3582.]

3779. AHTYRCEV, B. P. Izmenenie obyknovennogo černozema pod vozdeistviem 80-letnego dubovogo nasaždenija. [Changes in an ordinary chernozem brought about by an 80-year-old Oak plantation.] *Podčoved.* 1956 (11), (50-8). 9 refs. [Russ.] A.P.B.

Morphological, chemical and physical analyses were made of a chernozem under a stand of pure Oak established in 1875 in Voronezh province, which is compared with chernozem under fallow and a dark-grey forest soil. Data are tabulated by horizons. Under Oak the top 15 cm. has acquired a good, water-stable crumb structure which improves porosity, permeability, water-holding capacity and other physical properties. Humus and N contents have increased, as have also total contents of P_2O_5 , CaO and MgO, indicating increased fertility. At 20-30 cm. depth the humus is more mobile and the water-soluble humus content is higher and NO_3 content lower; exchangeable H is present, acidity increases, and base saturation decreases. Between 40 and 90 cm. the soil structure deteriorates and there are decreases in humus content, N, P_2O_5 and CaO. On the whole, the soil has become intermediate between an ordinary chernozem and a leached chernozem, but podzolization has not occurred.

3780. BOND, G. Evidence for fixation of nitrogen by root nodules of Alder (*Alnus*) under field conditions. *New Phytol.* 55 (2), 1956 (147-53). 9 refs. O.R.S.

[Cf. *F.A.* 17 No. 1333.] Root nodules of *A. glutinosa* growing in field conditions were enclosed without separation from the tree, and exposed to an excess of free N^{15} . In spite of cool wet weather during the test, most of the nodules showed a significant increase in the proportion of N^{15} to total N. Acid extracts of the other nodules also showed an increase in N^{15} , but roots without nodules showed no increase. It was also shown that fixed N is translocated to other parts of the tree. The amount of atmospheric N fixed by the nodules is probably large.

3781. VIRTANEN, A. I. **Investigations on nitrogen fixation by the Alder. II. Associated culture of Spruce and inoculated Alder without combined nitrogen.** *Physiol. Plant., Copenhagen* 10 (1), 1957 (164-9). 2 refs.

Seedlings of *Picea abies* were grown from 1931 to 1942 in quartz sand in association with seedlings of *Alnus glutinosa* that had been inoculated with a water suspension of crushed Alder root nodules. No combined N was added; but the test plants were watered with a nutrient solution of $MgSO_4$, KCl, KH_2PO_4 , $CaCO_3$ and tapwater. All fallen Alder leaves were removed from the soil surface. After 7 years, seedlings of both species were analysed to determine the amount of dry matter and the N content of different parts of the plant. Results are tabulated. Results of analyses after 11 years were lost during the war but photos show the growth of both species. Spruce obtained N fixed in the nodules of Alder roots even during its first years of growth. Data are given on the amount of N fixed by Alder after 7 years.

3782. LEVISOHN, I. **Antagonistic effects of *Alternaria tenuis* on root-fungi of forest trees.** *Nature, Lond.* 179 (4570), 1957 (143-4). 2 refs.

Alternaria tenuis has been observed to exert antagonistic effects on a number of mycorrhiza-formers for ectotrophic tree species. The two active forms of *A. tenuis* tested were isolated from two forest nursery soils of the arable type in which this fungus is generally abundant. Reactions of the mycorrhizal mycelia to the antagonistic principle of *A. tenuis* were recorded for mixed cultures on a synthetic medium in the following order: *Boletus granulatus*, *B. variegatus*, markedly inhibited; *B. bovinus*, *Rhizopogon luteolus*, inhibited; *B. scaber*, mildly inhibited. Pseudomycorrhizal fungi showed no such effects. Experiments designed to analyse possible effects of this antagonism in the field, e.g. on growth on young trees, are in progress.

3783. BOKOR, R. A mycorrhiza-gombák által termelt antibiotikumok hatása egyes fenyőfélék magjának csírázására. (I. közlemény.) [Influence of antibiotics produced by mycorrhizal fungi on the germination of seeds. I.] *Erdész. Kutatás., Budapest* 1956 (1), (67-79). 8 refs. [Hu.russ.e.g.]

Where mycorrhizal fungi assume absolute dominance in the soil, e.g. in old closed stands, seed germination may be inhibited by the antibiotics produced by them. The admission of heat and light to the forest floor reduces mycorrhizal activity and favours mould fungi, which decompose the accumulated antibiotics. This statement is supported by laboratory tests which show that antibiotic production increased with time and with weight of mycelia; the inhibiting effect on germination is specific, the true mycorrhiza of a tree species affecting the seed of that species in the highest degree; pseudomycorrhizal fungi appear not to have this effect; the presence of mould fungi counteracts this activity; antibiotics are soluble in water and so subject to leaching; no stimulation of germination occurs at low dosages; Scots Pine seeds are more sensitive than those of Austrian Pine; antibiotic accumulations in

nurseries (occurring chiefly after drought) can be leached out by watering.

3784. BAKSHI, B. K. **Occurrence of mycorrhiza on some Indian conifers.** *Mycologia* 49 (2), 1957 (269-72). 2 refs. P.R.

An illustrated description of mycorrhizae on *Cedrus deodara*, *Picea morinda*, *Abies pindrow* and *Pinus longifolia*.

3785. MORRISON, T. M. **Mycorrhiza of Silver Beech.** *N.Z. J. For.* 7 (3), 1956 (47-60). 16 refs.

The morphology and anatomy of the ectotrophic mycorrhizae of Silver Beech (*Nothofagus menziesii*) are described. Their structure is similar to that of mycorrhizae of *Fagus sylvatica*. The endophyte or endophytes of Silver Beech are not restricted to soils in which Beech trees are growing or have recently grown. Keeping soils in an air-dry condition for 7 months did not eliminate its infectivity. A relationship between light intensity and degree of mycorrhizal infection was demonstrated in Silver Beech. Mycorrhizal and non-mycorrhizal plants of Silver Beech and *Pinus radiata* were grown in a similar series of media. Under infertile conditions, Silver Beech showed no benefit from the association but growth of *Pinus radiata* was increased thereby. In fertile media, mycorrhizal Beech and Pine plants grew as well as non-mycorrhizal plants. *From author's summary.*

3786. MORRISON, T. M. **Mycorrhiza and phosphorus uptake.** *Nature, Lond.* 179 (4566), 1957 (907-8). 6 refs.

Following up his previous work on the uptake of P^{32} by mycorrhizal seedlings of *Pinus radiata* [cf. *F.A.* 16 No. 226], the author carried out a series of experiments from which it emerged that mycorrhizae of *P. radiata* form a barrier to P uptake by the host during the first few days after application of P. Thereafter, mycorrhizae enhance P uptake by the host tissues. It would appear that in mycorrhizae there is an initial rapid absorption and accumulation of P by the mantle from the medium, and a slower but relatively constant transfer from the mantle to the host tissues, after application of P. During the second phase the rate of transfer is markedly in excess of P supplied by non-mycorrhizal roots, and is less dependent upon the accumulatory processes of the host tissues than is absorption by non-mycorrhizal roots. The results obtained in experiments of this kind will therefore differ according to the duration of the experiment.

3787. MOSSE, B. **Growth and chemical composition of mycorrhizal and non-mycorrhizal Apples.** *Nature, Lond.* 176 (4566), 1957 (922-4). 3 refs.

Apple seedlings and leaf-bud cuttings rooted in vermiculite were later transplanted to a sterile loam and sand mixture in pots, half of which were then inoculated with sporocarps of an *Endogone* sp. the ability of which to produce vesicular-arbuscular mycorrhizae has been demonstrated. Ordinary tapwater was used for watering. Plants were observed during the growing period, and their weight, height, number of leaves and, in some cases, chemical composition were recorded at the end of the experiment. Examination showed that all plants in

inoculated treatments (a) were strongly mycorrhizal, whereas with one exception the controls (b) had remained free of infection. Results of 5 experiments over a period of 3 years are discussed. In the case of cuttings, mean weight of (a) was 3.8 and of (b) 2.9 gm.; (b) usually started growing first but were soon overtaken by (a). In the case of seedlings, (b) extended rapidly for the first 8 weeks, but were gradually overtaken by the sturdier, darker green (a) seedlings, which continued apical growth for about 6 weeks longer and were finally the bigger plants. The results of chemical analysis (values for controls in brackets) were, per plant: K % 49.67 (35.2), Ca % 30.25 (20.69), Mg % 5.1 (4.28), Fe 2.61 mg. (1.49), Mn 0.76 mg. (1.12), Cu 0.21 mg. (0.11).

3788. RICHARDSON, S. D. **Studies of root growth in *Acer saccharinum*. V. The effect of a long-term limitation of photosynthesis on root growth rate in first-year seedlings.** *Proc. ned. Akad. Wet.* 59C (5), 1956 (694-701). 3 refs. [E.e.] O.R.S.

When seedlings were transferred from a light intensity of 5000 luxes to 200 at a temperature of 20° C., rate of root elongation fell immediately, rose after some days and eventually fell again and root growth stopped. There was a highly significant inverse relationship of the time required for the observed rise in growth rate to plant dry weight. Both rate and duration of growth were linearly related to dry weight, but there was no direct relationship between these variables and leaf area. Correlations were closer for root than for shoot weight; this provides support for the suggestion [see *F.A.* 15 No. 747] that in these conditions the reserves used in root growth (at any rate initially) are sited in the root system. *From author's summary.*

3789. WOODS, F. W. **Factors limiting root penetration in deep sands of the southeastern coastal plain.** *Ecology* 38 (2), 1957 (357-9). 3 refs.

Root penetration of all species is very shallow on these sandhills; fertility is poor, field capacity small, and the water table at least 40-50 ft. below the surface. The scrub Oak (mainly *Quercus laevis* and *Q. incana*) and *Pinus palustris*, like all other species, form a thick mat of fibrous roots within 4-5 in. of the surface. Below this are a few large roots and almost no small ones. The factors influencing this form of root system are the superior moisture, nutrient status and temperature in the surface soil.

3790. ROBERTS, E. G. **A logical approach to isolation strip width.** *For. Sci.* 3 (1), 1957 (73-4).

The determination of optimum width of isolation strips between experimental plots should be based, in the author's view, on the following assumptions: (1) In many cases, the chief factor from which a plot must be isolated is dissimilar conditions of root competition. (2) Competing root systems will occupy, on the average, hexagonal areas. (3) On a given site, with a given species, the area of land occupied by a tree is directly proportional to its basal area. A simple formula,

$$D = \sqrt{\frac{A}{0.866}}$$

where D = distance between boles (or diameter of a hexagon) and A = area occupied by one tree, is used for determining isolation-strip width, and several examples are worked out, taking into account the occurrence of trees straddling the plot boundaries, increase in diameter of trees during an experiment, etc.

3791. BESKARAVAŇNÝĚ, M. M. **Образование биогрупп в сосновых насаждениях камышинского лесомелиоративного опытного пункта. [The development of root-grafted tree groups in Pine stands of the Kamyshin field station.]** *Agrobiologija* 1956 (1), (143-6). [Russ.] I.M.I.

Observations were made in a 35-year pure Pine sample plot, 25 × 25 m., with a total of 77 surviving trees, of which 37 had root-grafts. The root-grafted trees formed 11 groups, one of 11 trees, the others of 2-4 trees. Data are tabulated on the maximum and average height, diam., and volume of the 11 groups. The mean volume of the root-grafted trees was twice the mean volume of the 40 trees without root-grafting. Where one or more trees in a group had been felled 18 years previously, the development of the rest appeared to be retarded, perhaps owing to the loss of nutrients consumed by the live stumps. [Cf. *F.A.* 17 No. 2560.]

3792. BESKARAVAŇNÝĚ, M. M. **Сростание корневых дуба в насаждениях камышинского лесомелиоративного опытного пункта. [Oak root-grafting in stands at the Kamyshin field station.]** *Agrobiologija* 1956 (4), (119-22). 1 ref. [Russ.] I.M.I.

In 25-year-old stands of Oak planted in lines in mixture with Pine and Maple, the Oak is heavily suppressed and has become stagheaded. In rows of pure Oak, root-grafting has taken place, and growth is satisfactory. Observations were also made on 5-year-old Oak seedlings sown by the nest method and averaging 3-6 per seed spot. Root-grafting frequently takes place in the 3rd or 4th year; root-grafted seedlings grow better than others. For this region, nest sowings were better than line sowings.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See Nos. 3656, 3790, 3829, 4181-2.

181.5. Reproductive Behaviour

See also Nos. 3715, 3783, 3868, 3889 *et seq.*

3793. SARVAS, R. **Investigations into the flowering and seed quality of forest trees.** *Commun. Inst. for. Fenn.* 45 (7), 1956. pp. 37. 13 refs. [E.e.f.i.]

[Cf. *F.A.* 16 No. 237.] Reports observations on similar lines to those described in the earlier paper, for *Betula verrucosa*, *B. pubescens*, *Picea abies* and *Pinus sylvestris*. An improved pollen sampler with automatic rain protection is described. Seasonal variations in onset, development and amount of flowering and pollen production are related to spring temperatures, and largely to internal or external factors influencing the development of the buds. Rain seemed to have less effect on pollen release than is commonly assumed. Diurnal variations differed between species and seemed to depend on air temperature. Pollen production was greatest

and varied least between years, in Pine, and was smallest and most variable in Spruce. Incomplete pollination was confirmed as the chief source of empty seeds in Birch, and as an important factor in Spruce; for Pine, usually having fewer empty seeds, no final conclusions were reached.

3794. **Birds as seed carriers.** *Newslett. N.Z. For. Serv.* 7 (3), 1957 (4).

Trays placed under Kamahi [*Weinmannia racemosa*] trees left standing in a cut-over area, collected a mixed lot of seed contained in bird droppings. The most important contribution was an average of 40,000 Rimu [*Dacrydium cupressinum*] seeds/acre. The birds also dropped seed on trays placed out in the open, at the rate of ca. 4000/acre. On the other hand, the spread of seed by wind amounted to 14,000/acre at one chain from the forest edge, but there was none at 2 chains or more. When strip-felling was first instituted as a method of working Podocarp forest, it was hoped that the wind would spread seed right across the 4- to 5-chain felled strips, but it now seems that birds are more likely to play the major role.

3795. VABRE-DURRIEU. Le froid et les graines de quelques Abiétacées. [The reaction to cold of seed of some species of Abietineae.] *Trav. Lab. for. Toulouse* 1 (5) Art. 29, 1956. pp. 6. 1 ref. [F.]

As a result of germination tests [data tabulated] on a number of species, the author classifies them tentatively as follows: (1) Species with non-dormant seed: *Larix decidua*, *L. laricina*, *L. leptolepis*, *Picea abies*, *P. sitchensis*, *Pinus banksiana*, *P. canariensis*, *P. densiflora*, *P. halepensis*, *P. radiata*, *P. nigra* var. *austriaca*, *P. pinaster*, *P. pinea*, *P. resinosa*, *P. strobus*, *P. sylvestris*, *Tsuga heterophylla*, and *Tsuga-Picea hookeriana*. (2) Species with dormant seed, germinating at +2° C.: *Abies alba*, *A. nordmanniana*, *Cedrus atlantica* and *Pinus sabiniana*. (3) Species with dormant seed, germinating at +23° C.: *Abies grandis*, *Picea mariana*, *Pinus nigra* var. *calabrica*, *P. attenuata*, and *P. mugo* var. *rostrata*. Two species (*Pseudolarix kaempferi* and *Pseudotsuga taxifolia*) varied, some lots of seed displaying dormancy and others not.

3796. LUPE, I. Z. Contribuții la cunoașterea influenței luminii asupra germinăției semințelor de elm. [The influence of light on the germination of Elm seed.] *Rev. Pădurilor* 71 (8), 1956 (506-8). 2 refs. [Rum.russ.g.]

Like seed of *Ulmus glabra* and *U. turkestanica*, that of *U. carpinifolia* germinated better in the dark than in the light; total germination after 21 days 99% compared with 22% or 34% (in two different germinators).

3797. ISHIIKAWA, S., and ARAKI, S. [Effect of light upon the germination of forest tree seeds. (2) On the photoperiodic tendency.] *J. Jap. For. Soc.* 37 (11), 1955 (485-7). 9 refs. [Jap.e.]

In tests employing seed of *Pinus thunbergii*, *P. densiflora* and *Paulownia tomentosa* and 100 or 200 luxes, optimum photoperiods for promoting

germination were 9-15 hours. Exposure to continuous light lowered germination %s. [Cf. F.A. 16 No. 2900.]

3798. FURUKAWA, T. [The light germination of forest seeds. III. The effects of light illumination on stored seeds of Japanese Black and Red Pine.] *J. Jap. For. Soc.* 38 (3), 1956 (103-4). 4 refs. [Jap.jap.e.]

The following results were obtained: (1) Exposure of the seed to sunlight immediately after extraction increased germination, the effect lasting for 2-3 months; (2) seeds stored in the dark gave low germination, but exposure to sunlight for 1 day before sowing raised germination to that of treatment (1); (3) storage in diffused light increased germination of Black [*Pinus thunbergii*] but not of Red Pine [*P. densiflora*] seeds. [Cf. F.A. 15 No. 3359.] *From author's summary.*

3799. GOO, M., and FURUSAWA, K. [Changes [in] the stored food within the seeds of *Pinus densiflora* and *P. thunbergii* during the course of germination—by microchemical tests.] *J. Jap. For. Soc.* 37 (11), 1955 (481-4). 2 refs. [Jap.e.e.]

Presents results of analysis at five stages (up to the appearance of the radicle), for starch, reducing and non-reducing sugars, fats and proteins in the endosperm and various parts of the embryo. The pH values of endosperm and root-cap of *P. densiflora* seeds pretreated at 5° C. were lower than in untreated seeds of both species. [Cf. F.A. 14 No. 1935.] *From authors' summary.*

3800. MIGITA, K., KAWANA, A., and TAKAHASHI, M. [Germination of the seeds of the Japanese Red Pine, *Pinus densiflora* S. et Z., in water with various contents of oxygen.] *J. Jap. For. Soc.* 38 (3), 1956 (105-6). 5 refs. [Jap.jap.e.e.] 4 gphs.

The seed-coat split more readily in water with lower O content (8 and 20 p.p.m.) but germination was highest in that with medium O content (50 p.p.m.). Best germination was obtained with O content low (10 p.p.m.) at the early stages of germination and high (100 p.p.m.) after the seed-coat had split. *From authors' summary.*

3801. ASAKAWA, S. Thermoperiodic control of *Fraxinus mandshurica* var. *japonica* seeds. *J. Jap. For. Soc.* 38 (7), 1956 (269-72). 13 refs. [E.e.jap.]

Seeds stratified for different periods first at 25° and then at 2° C. [cf. F.A. 18 No. 2606] showed marked response to alternating temperatures of 8° and 25° during germination. Germination appeared to be inhibited by a constant temperature of 25°, or maintenance of such a temperature for 22 hours/day, and increased with increasing hours, at 8°, to 20 hours/day. This thermoperiodic effect was reduced if the period of cold stratification was lengthened in relation to that of warm stratification. Germination was not affected by diffused light for 8 hours/day, or by continuous artificial light at 25°. Thermoperiodic responses appeared to be affected by the ratio of the 25° to the 8° period, rather than by their absolute length, e.g. germination was similar for an 8-hour/16-hour and for a 24-hour/48-hour cycle at 25° and 8° respectively. Seeds that

failed to germinate after continuous treatment at 25°, germinated after storage for some months at 2°. Excised embryos of stratified seed germinated readily at 25°, whether they had been subjected to warm and cold stratification or to warm stratification only.

3802. MARJAI, Z. Nyármag csírázásfiziológiai vizsgálata. [Germination-physiological investigations on Poplar seeds.] *Erdész. Kutatás., Budapest* 1956 (3), (95-109). 13 refs. [Hu.russ.e.g.]

The germination of *P. canescens* and *P. tremula* × *P. tremuloides* was studied on wet filter paper and on the surface of, and under, water. Cotyledons, hypocotyl and root-hair coronet develop in the first 4 days, and faster in darkness, which has, however, a variable and a depressive effect on germinative energy and capacity respectively. More light is required after this initial period, when radicle growth begins.

3803. HOSNER, J. F. Effects of water upon the seed germination of bottomland trees. *For. Sci.* 3 (1), 1957 (67-70). 6 refs.

Laboratory studies involving water-soaking of seeds of *Acer rubrum* var. *drummondii*, *A. saccharinum*, *Ulmus americana*, *Platanus occidentalis* and *Populus deltoides*, for 0, 4, 8, 16, and 32 days, indicate that flooding for periods up to 32 days has no appreciable effect (except perhaps through siltation) on the germination of these species; in some, germination was improved.

3804. HARRING, P. P. Contribuții la studiul regenerării radiclei la ghinda de stejar. [The development of the radicle in acorns.] *Rev. Pădurilor* 70 (11), 1955 (508-11). 6 refs. [Rum.]

A detailed study on acorns of *Quercus robur* and *Q. sessiliflora*. No differences were observed between the two species.

3805. LEANDRU, L. Creșterea periodică a puieților de salcîm în primul an de vegetație. [Periodic growth of *Robinia pseudoacacia* seedlings during their first growing season.] *Rev. Pădurilor* 71 (8), 1956 (504-6). 3 refs. [Rum.]

Compares height increment and (a) dry weight, (b) green weight increment in *Robinia* seedlings and shows that there is a close correlation between them, and also between water content of the plants and soil moisture.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 4432, 4440-2.

3806. MYCZKOWSKI, S. O formach pokrojowych świerka pospolitego (*Picea excelsa* (Lam.) Link.) w Tatrach Polskich. [Habit of growth of *P. abies* in the Polish part of the High Tatra Mts.] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 11, 1956 (407-12). 7 refs. [Pol.]

At lower altitudes most of the trees have the normal broadly branched crown, but the proportion of the narrow-crowned trees increases steadily towards the upper limit of the species, which at the same time tends to change from a shade-bearer to a light-demander. When growing in groups, trees at lower altitudes shed their branches facing the interior of the group, but at higher altitudes this

unilateral branching extends only to a certain height up the stem, above which normal branching is seen. Above the upper forest limit (in the region of prostrate tree forms), erect forms of Spruce may be found up to 1700 m., often in rows showing pronounced unilateral branching as a result of wind-trimming.

3807. ÅKEBRAND, V. Om sambandet mellan tallens kvistrensning och vissa ståndortsförhållanden inom Sällskapet för praktisk skogsförädling inventeringsområde 1952-54. [The relation between self-pruning of Pine and site factors in the survey area of the Sällskap för praktisk skogsförädling, 1952-54.] *Norrland SkogsvFörb. Tidskr.* 1957 (1), (95-109). 8 refs. [Sw.]

A study of maps showing rainfall and relative humidity, and districts of good, medium and poor self-pruning in S. Norrland and Dalarna shows that, particularly near the coast, good self-pruning is related to high rainfall, especially in July and August, when decay organisms are most active. Self-pruning is also higher in areas with soil conditions favouring a rich herb or undershrub layer than on sites covered with heather, moss and lichens. Further research is desirable.

3808. PARIZEK, E. J., and WOODRUFF, J. F. Mass wasting and the deformation of trees. *Amer. J. Sci.* 255 (1), 1957 (63-70). 12 refs. O.R.S.

Discusses the mechanical and physiological causes of tree deformation and the hypothetical type of curvature (a long sweeping curve from ground to terminal bud) that would develop under the influence of concomitant tree growth and soil creep. Concludes that such curvature is rarely, if ever, observed and that mechanical and physiological causes are more valid explanations of the type of curvature that does exist. The other criteria regarded as evidence of soil creep should also be re-examined.

3809. PETRESCU, L. Influența schemelor de plantare asupra secțiunilor transversale la plopul negri hibridi. [The influence of planting arrangement on cross-sectional form of hybrid Black Poplars.] *Rev. Pădurilor* 71 (8), 1956 (509-13). 5 refs. [Rum.russ.g.]

Analysis of stem form in 8 plantations showed that the amount of excentricity was directly related to the degree of irregularity in planting rows. In perfectly symmetrical plantations, excentricity, when it occurred, appeared to be always oriented in the same direction, depending upon the prevailing wind.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See also Nos. 3990-1.

3810. GORDON, C. A. Yew trees at Ellon Castle, Aberdeenshire. *Scot. For.* 11 (2), 1957 (77-8).

Measurements are given of 9 Yew trees, planted 1711-15, which were measured in 1890 and again in 1956. The dimensions recorded were height, girth at 1 or 2 ft., and radial spread of branches. Increase in stem diameter during the 66 years averaged 6½ in.

181.8. Phenology

See also Nos. 3697, 3705, 3767-9, 3777, 4440.

3811. BAUMGARTNER, A., KLEINLEIN, G., and WALDMANN, G. Forstlich-phänologische Beobachtungen und Experimente am Grossen Falkenstein (Bayrischer Wald). [Silvicultural and phenological observations and experiments on the Grosser Falkenstein (Bavarian Forest).] *Forstwiss. Cbl.* 75 (9/10), 1956 (290-303). 5 refs. [G.g.]

Presents observations on the phenology during the 1955 growing season of some tree species, along with that of some species from the ground flora at altitudes between 600 and 1312 m. The results are intended to constitute a basis for the climatic assessment of site quality. *From authors' summary.*

3812. TOMESCU, A. Repausul vegetativ al mugurilor. [Dormancy in buds.] *Rev. Pădurilor* 70 (11), 1955 (501-5). 7 refs. [Rum.]

Detailed observations were made (data tabulated) in the winter and spring of 1953-54, on buds of *Corylus avellana*, *Cornus mas*, *Alnus glutinosa*, *Quercus cerris*, *Q. robur*, *Fraxinus excelsior* and *Acer platanoides*. It is concluded that there are two stages in dormancy of woody species: (1) deep (organic or spontaneous) dormancy, initiated by internal processes, and (2) induced dormancy, provoked by unfavourable weather.

3813. KOZLOWSKI, T. T., and WARD, R. C. Seasonal height growth of conifers. *For. Sci.* 3 (1), 1957 (61-6). 16 refs.

The nursery growth over one season of 3-year seedlings of *Picea glauca*, *P. abies*, *Tsuga canadensis*, *Pinus resinosa* and *Abies balsamea* was measured at weekly intervals. The specific variation in growth is graphed and discussed. The amount of growth was not related to length of growing season. All began growth in the spring frost period and ceased long before the autumn frosts began.

3814. Early growth of planted Slash Pine. *Rep. Steast. For. Exp. Sta.* 1956, 1957 (55-6).

Annual height measurements on field-planted seedlings in the Coastal Plain of Georgia showed that growth averaged 0.5 ft. in the first, 1.9 ft. in the second, and 2.9 ft. in the third year after planting. Seasonal growth curves show that the greatest height growth occurred in April; 77% in one year, 68% in another, of the annual growth was completed at the end of May.

182. Synecology, Plant Sociology: General, Principles and Methods

3815. C.S.A. Specialist meeting on phytogeography [of Africa], Yangambi [Belgian Congo], 28 July-8th August 1956. *Publication, Scientific Council for Africa South of the Sahara*, London No. 22, 1956. pp. 33. [E.F.]

Presents 22 resolutions covering proposals on methods, organization, target dates and other recommendations for initiating or completing work on maps of chorological units and natural territories; vegetation nomenclature (including the agreed broad physiognomic classification); mapping at regional level; A.E.T.F.A.T. draft map; botanical

atlas for all Africa (larger-scale vegetation maps, and climate and soils maps); species area distribution; aerial photography and vegetation maps; an African generic flora; special ecological research; study of physical factors of environment, etc.

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 3629, 3708-9, 3827.

3816. MOREAU, R. E. Ecological changes in the Palaearctic region since the Pliocene. *Proceedings of the Zoological Society, London* 125 (1), 1955 (253-95). 6½ pp. of refs. O.R.S.

The climatic sequence during and since the Pleistocene is summarized. The vegetation of Europe during the best documented glacial phase, i.e. Phase 2 of the last glaciation, is discussed on the basis of recent maps. Trees were practically eliminated from Europe north of a line through the Pyrenees, the southern foot of the Alps, and the Carpathians, except for a strip of wooded tundra and wooded steppe across central Russia. Deciduous species were confined to the southern end of the Iberian, Italian and Balkan peninsulas, and the coasts of Barbary and Asia Minor. Similar conditions recurred in Phase 3 and again ca. 10,000 years ago. By contrast, at the height of the interglacials, deciduous and coniferous forest extended several degrees farther north than at present; in Europe treeless tundra was probably eliminated from the arctic lowlands. In palaearctic Asia the vegetational conditions during the glaciations are more obscure than in Europe; but during the last glaciation trees appear to have existed, at least sparsely, all across Siberia. *From author's summary.*

3817. MORRISON, M. E. S. Factors in the degeneration of the prehistoric woodland. *Irish Naturalists' Journal, Belfast* 12 (3), 1956 (57-65). 13 refs. G.U.

Discusses the influence of climatic deterioration and prehistoric farming methods upon the formation of the Scandinavian and Irish peat bogs, and suggests that the pre-bog woodland was frequently Pine, which degenerated into open woodland or scrub with a greater % of Birch, owing to the formation of podzols under the Pine. The author suggests that these edaphic factors may have initiated the destruction of the woodlands, which was later accelerated by blanket-bog formation during the subsequent or contemporaneous climatic deterioration.

3818. EDLIN, H. L. Beech as a native of the Lake District. *Quart. J. For.* 51 (2), 1957 (167).

A note on the occurrence of Beech wood on neolithic sites, and Beech pollen in peat at Ehenside Tarn, which prove the existence of Beech in the Lake District at least as early as the second millennium B.C. Beech, accordingly, must be accepted as native, at least locally, in the North of England.

3819. FIRBAS, F., and ROCHOW, M. VON. Zur Geschichte der Moore und Wälder im Fichtelgebirge. [The history of the peat bogs and forests in the Fichtelgebirge.] *Forstwiss. Cbl.* 75 (9/10), 1956 (367-80). 16 refs. [G.g.]

The post-glacial history of the forests of the Fichtelgebirge is reconstructed from pollen analyses of peat bogs.

3820. HAUFF, R. Pollenanalytische Beiträge zur nachwärmzeitlichen Waldgeschichte des Schwäbisch-Fränkischen Waldes. [Pollen-analytical contributions to the forest history of the Swabo-Franconian forest in the sub-Atlantic and recent periods.] *Mitt. Ver. forstl. Standortskart.* No. 5, 1956 (3-9). 13 refs. [G.g.]

At the beginning of the period, the two chief types of the region (N.E. of Stuttgart) were a montane Beech/Silver Fir, and a sub-montane Beech/Oak forest. The present coniferous character of the forest, with Spruce predominating, is a result of human interference.

3821. JÄNICHEN, H. Die Holzarten des Schwäbisch-Fränkischen Waldes zwischen 1650 und 1800. [The tree species of the Swabo-Franconian forest between 1650 and 1800.] *Mitt. Ver. forstl. Standortskart.* No. 5, 1956 (10-31). 13 refs. [G.]

3822. BANTI, G. Tracce di abetine originarie e possibilità di reintroduzione dell'abete bianco nell'appennino genovese. [Traces of original Fir stands and the possibility of re-introducing *Abies alba* in the Genoese Apennines.] *Nuovo G. bot. ital.* (n.s.) 63 (1), 1956 (77-111). 30 refs. [It.it.f.] A.P.B. Also in *Ital. for. mont.* 12 (3), 1957 (115-29).

Describes several beds containing fossilized *A. alba* in the Genoese Alps, and concludes that its disappearance from this region was probably comparatively recent and due to human intervention, and that it could be safely re-introduced.

3823. MARINKOVIĆ, P., and GAIĆ, M. O jednom nazalištu sfagnumskog tresača u Srbiji. [A sphagnum bog site in Serbia.] *Šumarstvo* 9 (4/5), 1956 (258-62). 3 refs. [Croat.e.f.]

Pollen analysis of 4 horizons of a sphagnum bog on Mt. Kotlenik revealed small amounts of conifer pollen, mainly Silver Fir with some Spruce and Pine. There are no conifers in the present forest communities, which are *Carpinetum orientalis* and *Fagetum montanum*.

3824. POTZGER, J. E., and COURTEMACHE, A. A series of bogs across Quebec from the St. Lawrence Valley to James Bay. *Bull. Serv. Biogéogr.* No. 15, 1956, pp. 28. 18 refs. [E.]

Pollen analyses were made for 19 bogs at about 50-mile intervals, from lat. 45° 07' to 51° 59'N., and the results are presented and discussed in detail. The single most striking feature of the study is the discovery that *Pinus strobus* and *P. resinosa* penetrated as far north as 51° 28' as an important forest association during a prolonged warm dry period ending ca. 3000 years ago. [Cf. *F.A.* 18 No. 240.]

3825. POTZGER, J. E., POTZGER, M. E., and MCCORMICK, J. The forest primeval of Indiana as recorded in the original U.S. land surveys and an evaluation of previous interpretations of Indiana vegetation. *Builer Univ. bot. Stud.* 13 (1), 1956 (95-111). 42 refs. O.B.D. [Cf. *F.A.* 13 No. 1965.]

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 3774, 3838, 3841, 3843, 3849, 4023.

3826. RUSSELL, N. H. Natural succession in planted conifer forests in eastern New York. *Proc. Iowa Acad. Sci.* 62, 1955 (223-30). 9 refs. L.S.

In 1954, on the Huyck preserve, N.Y., 22- to 30-year plantations of *Pinus resinosa* and *Picea glauca*, pure and in mixture, were sampled to determine the nature and extent of plant succession, and a comparison made with adjacent old fields. Ten stands were sampled in all, 6 by the random-pairs method, the rest by taking 2 transects (2 × 75 m.) in each. Almost no reproduction of Pine and Spruce had occurred, and openings in the stands had been invaded by hardwood species which in some cases overtopped the conifers; the most important of these was *Fraxinus americana*, then *Prunus* spp., *Acer saccharum* and *Populus tremuloides*. On old-field communities invasion by woody species was just beginning and the composition of the fields appeared to have changed little in the last 30 years. The data suggest that clearing and planting the sites with Red Pine and, particularly, White Spruce has speeded up natural succession.

3827. NICHOLLS, J. L. The historical ecology of the indigenous forest of the Taranaki upland. *N.Z. J. For.* 7 (3), 1956 (17-34). 16 refs.

The hill country of Taranaki (North Island, New Zealand) and the hardwood/Podocarp forest of the region are described broadly. The forest is primarily an association of a few hardwoods (principally *Beilschmiedia tawa* and *Weinmannia racemosa*). Grouping of these is largely dependent on topographically controlled factors, but in general they have been in equilibrium with the general environment since the final cold period of the Pleistocene (ca. 15,000 years ago). Scattered among these basic hardwoods is a variety of less adaptable ones and several Podocarps (*Dacrydium cupressinum*, *Podocarpus ferrugineus*, *P. hallii*, *P. dacrydioides*, *P. spicatus* and *Phyllocladus trichomanoides*). Some of these have been permanently limited to special sites, others have been more or less universally distributed, but now display a marked lack of advance growth. This is held to be neither the result of linear succession, nor a phase in a successional cycle, but due to a recent, locally slight, climatic variation. [Cf. *F.A.* 16 Nos. 1536-7.]

3828. The cicada—instrument of succession. *Newslett. N.Z. For. Serv.* 7 (3), 1957 (3-4).

Records observations on areas of dense pole-stage Rewarewa [*Knightia excelsa*] which showed marked crown deterioration often ending in death. This was apparently due to intense and repeated attack by cicadas, which seemed to concentrate in such areas. The following sequence of events appears to have taken place in the development of these stands. First the area, denuded by fire or some other agency, is colonized by *Leptospermum* spp. Into this primary nurse, Kauri [*Agathis australis*] is seeded from surrounding, but often quite distant, seed sources. At the same time, Rewarewa becomes widely established, grows rapidly, and shades out or

seriously weakens the *Leptospermum*. The Rewarewa then itself begins to suffer a decline due to cicada attack, and the Kauri, now 3-6 ft. high, benefiting from improved illumination, passes quickly through the weakened canopy above to form dense pole stands.

3829. DICK, R. D. Sixty years after a Mountain Beech [*Nothofagus cliffortioides*] forest fire. *N.Z. J. For.* 7 (3), 1956 (104-8).

Gives detailed results of ecological observations. The area, continuously grazed, has been converted from forest to grassland.

3830. SVENSSON, H. En kartometrisk metod för bestämning av skoggränsens höjd. [A cartometric method of determining the altitudinal forest limit.] *Svenska SkogsFören. Tidskr.* 54 (2), 1956 (205-8). 3 refs. [Sw.]

The method is based entirely on contour maps and topographical maps showing forests. An example is given of its use in determining the upper limits of Birch on a strip running from the W. coast of Norway across the mountains into Sweden at 65° N. A line 130 km. long was drawn along the middle of the strip and 13 contiguous rectangles, 10 × 20 km., were marked on each side of the line. For each rectangle a hypsographic curve was constructed from planimeter readings on the contour map, showing the % area lying above each major contour. The % area of land above the limit of Birch forest (a) was determined in the same way from the topographical map. The mean limit of Birch for the rectangle was then found from the hypsographical curve by reading off the altitude corresponding to (a). This method smooths out the effect of local factors, e.g. exposure.

182.5. Synecological Measurements and Methods

See also No. 4407.

3831. SHIUE, C.-J., and BEAZLEY, R. Classification of the spatial distribution of trees using the area sampling method. *For. Sci.* 3 (1), 1957 (22-31). 7 refs.

Describes with statistical argument a method of consistently classifying the spatial relationships of trees in plots in terms of probable departure of (a) skewness and (b) central tendency from a standard rectangular distribution, i.e. a distribution where an equal number of plots contain 0, 1, 2, 3 . . . trees. The test for (a) indicates the relative spacing in the clumps of trees, that for (b) the 'clumpiness' of the forest. With slight changes the method could be applied to continuous distribution e.g. basal area. Applications in ecology, silviculture, and logging are indicated.

3832. BHARUCHA, F. R. Methods for the study of tropical vegetation. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*, pp. 3.

Discusses the possibility of applying, and the desirability of adapting, existing synecological methods to the conditions of tropical (especially forest) vegetation.

3833. MACFADDEN, C. H. Humid tropical vegetation research by aero-field techniques and photography. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*, pp. 8. 2 refs.

3834. STEENIS, C. G. G. J. VAN. Concise outline of Malaysian vegetation mapping and literature. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*, pp. 12. 62 refs.

3835. BEDARD, P. W. Reconnaissance, classification, and mapping of Philippine forests. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*, pp. 9. 9 refs.

Reviews existing knowledge and current work on vegetation types.

3836. TAYLOR, B. W., and STEWART, G. A. Vegetation mapping of the territories of Papua and New Guinea conducted by C.S.I.R.O. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*, pp. 20. 27 refs.

182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

See Nos. 3683, 3826.

187. Vegetation Types

See also Nos. 3631, 3639, 3653, 3659, 3832-6, 4032, 4425-9, 4455-8, 4826.

3837. IZDEBSKI, K. Drzewa i krzewy rezerwatu cisowego Wierzchlas i struktura biologiczna drzewostanu. [Trees and shrubs of the Wierzchlas Yew preserve and the biological structure of the stands.] *Zeszyty Naukowe Uniwersytetu M. K. Torunin, Biologia* 1, 1956 (5-41). [Pol.] From abstr. in *Biol. Abstr.* 31D (3), 1957 (No. 6935).

A historical sketch of the preserve is given, and the ecology and distribution of 43 species of trees and shrubs is presented. Two types of forest are discerned: *Alnetum glutinosae typicum* and *Quercetocarpinetum medioeuropaeum*, in the second of which the Yew grows. The views of Paczoski, according to which the forest is at present regenerating after partial damage, are confirmed.

3838. WITT, L. Javaslatok az erdeifenyőerdőtípusok kialakítására. [Suggestions for establishing Scots Pine forest types.] *Erdész. Kutatás., Budapest 1956* (3), (83-94). [Hu.russ.e.g.]

An examination of the natural and planted stands in Hungary, with tables illustrating their associations, indicator plants, succession and silviculture (rotation, height-growth, suitable composition and structure). Succession proceeds from pure stands on podzols to mixtures with Beech (Atlantic) and Oak (continental) types. In these dry, fresh, or humid Scots Pine forests, phenotypes cannot be distinguished. Crown-shape deviations are due to site.

3839. BIRCK, O., and HORVÁTH, E. Erdőtípusvizsgálatok a Gödöllői erdőgazdasági tájban. [Forest type investigations in the forest region of Gödöllő.] *Erdész. Kutatás., Budapest 1955* (2), (101-20 + smries in suppl.). [Hu.russ.e.g.]

Soil, ecological and silvicultural data are tabulated for 10 types of Oak forest [*Q. robur*, *Q. sessiliflora* and *Q. pubescens*], position on the slope and aspect being important influences. The Oak/Hornbeam of the lower middle slopes facing east is a recommended site for very good growth of *Q. rubra* var. *maxima*.

3840. JÁRÓ, Z. A lösz alapközet talaj- és erdőtipusai. [Soil and forest types of loess-derived rock.] *Erdész. Kutatás.*, Budapest 1955 (4), (87-109 + smries. in suppl.). 15 refs. [Hu.russ.e.g.]

Nearly 66% of Hungary carries typical loess which erodes where topography is unfavourable. The main soils developed are: chernozems which have never carried extensive closed forests, but on which afforestation with Austrian Pine and *Quercus pubescens* has been effected; brown forest soils, at 130-150 m. altitude, which carry Oak/Hornbeam and Ash/Oak forest, and scattered stands of *Q. pubescens*; rust-brown forest soils, at 180 m. and above, with similar forest but an increase of *Q. cerris*, which may dominate. It should be replaced with *Q. rubra*. Beech forest occupies this soil at the upper limit of the loess. *From author's summary.*

3841. MAJER, A. A Magasbakony termőhely-feltáráának eredményéből. [Some results of site investigations in the Magasbakony.] *Erdész. Kutatás.*, Budapest 1955 (2), (55-74 + smries in suppl.). 5 refs. [Hu.russ.e.g.]

As part of the country-wide forest site mapping, data on site, soil cover, stands and economic condition are given for forests of Beech (3 types), mixed Beech (5), Oak (5), and secondary [mainly regressive] Beech → Hornbeam, Beech/Oak → Turkey Oak, dry shrubby Turkey Oak/Oak, and Beech → Ash.

3842. BÁNKY, G., and SZÖNYI, L. Az északi Mátra termőhelyének feltárása. [Site investigations in the northern region of the Mátra mountains.] *Erdész. Kutatás.*, Budapest 1955 (2), (75-99 + smries. in suppl.). 5 refs. [Hu.russ.e.g.]

In an area of 733 ha., 24 types, mainly of Beech and Oak, are described. Aspect, depth of fertile soil, and altitude are dominating factors in this highly productive forest, which has been ill treated for centuries but which has since 1922 been placed under better management.

3843. BABOS, I. A Duna-Tisza közti homokhát termőhelyfeltárása. [Site investigations on the sand dunes between the Danube and the Tisza.] *Erdész. Kutatás.*, Budapest 1955 (2), (3-53 + smries in suppl.). 14 refs. [Hu.russ.e.g.]

Tabulates and describes the associations, soils and water-table levels in wooded areas on calcareous sands of aeolian origin, with soil profiles and site maps. *Populus alba*, *P. canescens* and Oak/Hornbeam are extending; succession from Poplar to *Quercus robur*/*Convallaria majalis* is recognized. Underplanting with Hornbeam is indicated on some better sites, and Robinia and Austrian Pine on some poorer ones. On others introduced Scots and Austrian Pine are regenerating naturally, with indications that this second generation is fairly resistant to local pests.

3844. FUKAREK, P. Prilog poznavanju šumskih zajednica u kojima se javlja poljski jasen. [Forest communities [of S.E. Europe] in which *Fraxinus angustifolia* occurs.] *Šum. List* 80 (1/2), 1956 (30-40). 21 refs. [Croat.]

Reviews 21 references (German, Austrian, Hungarian, Polish, Yugoslavian, Italian and Bulgarian). *F. angustifolia* occurs in the *Alneto-Ulmion* communities: viz.: *Saponarieto-Salicetum purpureae*, and *Alneto-Fraxinetum oxycarpae*; also in *Populetum albae* and in *Querceto-Fageta*.

3845. YU, T. T. [Fresh observations on *Larix gmelini* var. *principis-rupprechtii* in the north part of Shensi province.] *For. Sci.*, Peking 1 (2), 1955 (145-55). [Chin.]

Descriptive notes, giving location, main habitat and associates (*Picea asperata* and *P. neoveitchii*). It is found in Shensi up to 2620 m. alt., regeneration being scanty. The composition of the undergrowth, chiefly herbs and mosses, is described in some detail, with lists of scientific names, and tabulated data for 15 plots, 6 being pure Larch, 4 mixed with the Larch dominant, and 5 mixed with Larch more or less suppressed and secondary. [Cf. *F.A.* 18 No. 3758.]

3846. KARIZUMI, N., and TOKUI, O. [On the Beech forests of Takanawa peninsula, Shikoku.] *J. Jap. For. Soc.* 38 (7), 1956 (263-8). 9 refs. [Jap.jap.e.e.]

These forests are classified as *Fagus crenata*/*Sasamorpha purpurascens* association, with *Sasamorpha*, *Abelia* and *Cacalia* sub-associations.

3847. YAMANAKA, T. The warm temperate forest vegetation in the eastern part of Kochi Prefecture, Shikoku. *Japanese Journal of Ecology* 4 (4), 1955 (148-51). [Jap.e.] From abstr. in *Biol. Abstr.* 30 (12), 1956 (33682).

The climatic climax is broadleaved evergreen forest, dominated by *Shiia cuspidata*. The results of vegetation surveys of 7 residual stands are set out in figures and tables.

3848. SAUVAGE, C. Compte rendu floristique de l'excursion marocaine du VIII^e congrès international de botanique (14 juin-24 juin 1954). [Floristic account of the excursion in Morocco of the 8th International Botanical Congress.] *Travaux de l'Institut Scientifique Chérifien* [Tanger], *Série Botanique* No. 8, 1956. pp. 88 + 16 photos.

Contains 58 pages of plant lists arranged under Raunkiaer's life forms and covering about 26 stations from open water and rock to forest types (*Quercus suber*, *Q. ilex*, *Cedrus atlantica*, *Pinus pinaster*). There is a generic index of 5 pages.

3849. LETOUZEY, R. La forêt à *Lophira alata* de la zone littorale camerounaise. [The *L. alata* forest of the coastal region of Cameroun.] *Bois For. Trop.* No. 53, 1957 (9-20). [F.e.span.]

Recent enumerations carried out in Azobe (*Lophira alata*) forest have shown that this species, exceptionally abundant in the dominant layers, does not, under present conditions, regenerate naturally. The author explains how human interference has transformed a primary leguminous forest into a *L.*

alata forest. The deficiency in natural regeneration will probably bring about a succession to *Pycnanthus angolensis* forest. From author's summary.

3850. MANGENOT, G. Les recherches sur la végétation dans les régions tropicales humides de l'Afrique occidentale. [Research on vegetation in the humid tropics of West Africa.] *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 26. 9 refs. [F.]

With appendices on: (1) a provisional classification for Ivory Coast vegetation, (2) ecological characters of the principal Ivory Coast soil types.

3851. PURI, G. S. Problems in the ecology of the humid tropics. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 17 + 1 tbl. 50 refs.

Briefly reviews the present state of knowledge and outlines the most urgent problems for future research.

3852. AMMAL, E. K. J. An introduction to the genetical analysis of the humid forest flora of South Asia. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 8. 9 refs.

Discusses the possibility of using genetical data to help in the classification of humid forest flora, with special reference to India.

3853. MISRA, R. The study of tropical vegetation in Madhya Pradesh and the Gangetic Valley. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 23. 41 refs.

Reviews the state of research, with an appendix on the principal vegetational types of the area.

3854. CHATTERJEE, D. Tropical vegetation of Eastern India. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 11. 14 refs.

Reviews the peculiarities of tropical rain forest with particular reference to eastern India.

3855. NAVALKAR, B. S., and BHARUCHA, F. R. The geographical distribution of the halophytic plants of Bombay and Salsette Islands. *Abstr. in Proc. 40th Indian Sci. Congr., Lucknow 1953, 1954* (104). C.G.B.

Six zones of different halophytic plants can be distinguished according to their nearness to the sea and the consequent NaCl content of the soil. A comparison of the numbers of halophytes of Bombay and Salsette Islands is made with those of Sunderbans, the Malay Peninsula and S. Africa.

3856. AHMED, K. J. Tidal forests of East Pakistan—their growth and regeneration (with special reference to Sunderbans forests). *Pakistan J. For.* 7 (1), 1957 (27–38).

Describes the forests, the principal species (mostly Mangroves), soil, climate etc., and natural regeneration. Cites enumeration data to show that present management practices are having a deleterious effect on stand structure, and urges further research in the management of this type.

3857. HEDAYETULLAH, S. The study of tropical vegetation with particular reference to Pakistan.

Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956. pp. 13.

3858. ROSAYRO, R. A. DE. Tropical ecological studies in Ceylon. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 12. 29 refs. Also in *Ceylon For. (n.s.)* 2 (4), 1956 (168–75).

Reviews the work already done, particularly in regard to classification of vegetation types, and suggests lines for future study.

3859. HOLMES, C. H. The broad pattern of climate and vegetational distribution in Ceylon. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 25. 17 refs. Also in *Ceylon For. (n.s.)* 2 (4), 1956 (209–25).

3860. WYATT-SMITH, J. A note on the study of tropical vegetation. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 6. 8 refs.

Reviews achievements and current research in Malaya.

3861. PURSEGLOVE, J. W. The vegetation of humid tropics with special reference to Singapore. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 9. 13 refs.

3862. DILMY, A., and KOSTERMANS, A. J. G. H. Research on the vegetation of Indonesia. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 7.

A short review of research in progress.

3863. FOSBERG, F. R. Vegetation of the islands of Oceania. *Symposium on the study of tropical vegetation, UNESCO, Ceylon 1956, 1956*. pp. 14. 56 refs.

Reviews published work and research in progress, mainly on vegetation in Micronesia.

3864. KUCERA, C. L., and MARTIN, S. C. Vegetation and soil relationships in the glade region of the southwestern Missouri Ozarks. *Ecology* 38 (2), 1957 (285–91). 19 refs.

The glades described are areas of grass and herbaceous vegetation with a few shrubs, occurring in the midst of Oak woods. The glades occur on shallow soils above limestone, the woods on ridges and knolls representing the remains of a rocky mantle largely eroded away elsewhere. The limiting factors appear to be soil depth and moisture.

3865. STORIE, R. E., and BROWN, L. N. Transect from Lake Tahoe, California to the Pacific Ocean showing relationship between soil, physiographic position, geology, climate, natural vegetation and land use. *Proc. Soil Sci. Soc. Amer.* 20 (4), 1956 (562–5). 6 refs. O.R.E.

3866. POTTER, L. D. Phytosociological study of San Augustin plains, New Mexico. *Ecol. Monogr.* 27 (2), 1957 (113–36). 44 refs.

Describes the principal vegetation types and their distribution.

2. SILVICULTURE

See also Nos. 3738, 3838-9, 3843, 3921, 4809.

3867. **Forest practices developments in the United States 1940 to 1955.** Society of American Foresters, Washington, D.C. 1956. pp. 39. 69 refs. Price \$1.00.

Part I reviews the development of good silvicultural practice in general and regulation of cutting practices in 17 states; Part 2 is an annotated bibliography of the subject.

3868. SOEPARDI, R. Tanam menanam *Pinus merkusii* Jungh. et De Vr. di Tanah Gajo (Atjeh Tengah). [The cultivation of *P. merkusii* in the Gajo lands of central Acheh [Sumatra].] *Rimba Indonesia* 5 (9/12), 1956 (450-72). [Jav.jav.e.]

P. merkusii grows well in central Sumatra, on rocks, sand, tuff, limestone etc., but not on marshy or waterlogged soils. Climate rather than soil is the limiting factor. Seeds are plentiful and there is 30-40% germination; germination in the shade is, however, poor. Natural regeneration is easy and cheap, but complete dependence on natural regeneration is not recommended. *From author's summary.*

3869. MORANDINI, R. Recenti studi sul larice. [Recent studies on Larch.] *Monti e Boschi* 8 (4), 1957 (177-85). 14 refs.

Reviews the principal recent publications on the character and silviculture of European Larch (1936-1956), and discusses some of the silvicultural problems of the species.

3870. SANGAR, O. J. The establishment and maintenance of hardwoods. *Scot. For.* 11 (2), 1957 (65-71).

Discusses the economic and silvicultural factors involved in growing hardwoods in Great Britain at the present time.

3871. TRONCO, G. La pioppicoltura nell'attuale situazione. [The present state of Poplar-growing [in Italy].] *Ital. agric.* 94 (2), 1957 (138-59). [It.] E.M.B.

In connexion with a conference on Poplar-growing, reviews the present practices in Italy, including notes and photographs of results of horizontal planting of branch cuttings.

3872. PETROVIĆ, R. Lipa u šumama Fruške Gore i njen značaj. [Lime in the forests of Fruška Gora and its significance.] *Šumarstvo* 9 (1/2), 1956 (52-64). 5 refs. [Serb.e.f.]

Uses of Lime timber are discussed and the growth of *Tilia grandifolia*, *T. parvifolia*, *T. argentea* and *T. intermedia*, in Fruška Gora, Vojvodina, is described. Notes on regeneration and care are given.

3873. GOOR, A. Y. Establishment, management and protection of *Eucalyptus*. Round-up of successful methods and research needs. [With discussion.] *Final Rep. World Eucalyptus Conf.*, Rome 1956, 1956 (29-37). [E.]

Summarizes practical experience and research needs in seed collection and extraction, nursery

techniques (including soil requirements, sowing and transplanting, the use of containers, and root and top pruning), planting operations (including site preparation, spacing, season, and mixtures), tending and thinning, regeneration, yield and rotations, and protection.

3874. PHILIPPIS, A. DE. Rapport sommaire sur les *Eucalyptus* en Italie. [Summary report on Eucalypts in Italy.] [Docum.] 2nd Sess. Wkg. Party on Eucalypts, FAO Jt. Subcomm. Medit. For. Probl., Nice 1956, 1956. pp. 6. 5 refs. [F.]

Includes lists of species of proved or potential importance, with notes on resistance to the frost of 1956, planting methods, yields, rotations, uses (including *E. rostrata* for rayon manufacture), and research projects of the Centro di Sperimentazione Agricola e Forestale E.N.C.C., Rome.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 3887, 3899, 4453.

3875. STRØMSØE, B. Tømmertrestillinger vil for fremtiden erstatte frøtrestillinger som foryngelses-hogster for furu. [The 'timber-tree' method will in future replace the seed-tree method in regeneration fellings of Pine.] *Norsk Skogbr.* 3 (5), 1957 (119-20). [Nor.]

Reproduces and discusses, with reference to Norwegian conditions (concluding that the method is suitable for Østland), an article by R. Repo in *Skogsbruket, Helsinki* 1957 (1). This defines the future method as a seed-tree method, but leaving 10-12 residual trees per dekare (more on good sites and fewer on poor sites). Among the advantages claimed are the greater wind-firmness of the residual trees, more and better quality seed, considerable increment from the residual crop, less dependence on good seed-years, and a better chance of selling in a period of high prices.

3876. BRANTSEG, A. Tømmerstillinger eller frøtrestillinger i furuskog. ['Timber-tree' or seed-tree method [of regeneration felling] in Pine.] *Norsk Skogbr.* 3 (7), 1957 (183-4, 187). [Nor.]

In connexion with the article on the timber-tree method [see preceding abstract], gives results of an analysis of advance reproduction on different site types in Pine. Concludes that, on the better sites, advance growth that has grown 5-15 years or more under the relatively dense residual stand left by the timber-tree method will have shade needles and a poor root system, and will be quickly passed by seedlings appearing soon after the final felling; on these sites clear felling or the seed-tree method should be used. On poorer sites, where the residual stand has been less dense, advance growth will form a greater part of the new stand and the timber-tree method may be valuable. Advance growth on a

number of areas with a main-crop stocking equivalent to that of the timber-tree method has been marked and its development after the final felling will be studied.

3877. KÖSTLER, J. N. Allgäuer Plenterwaldtypen. [Types of selection forest in the Allgäu Alps.] *Forstwiss. Cbl.* 75 (9/10), 1956 (423–58). 9 refs. [G.g.]

Forty-eight plots in a forest area of 1800 ha. in an agricultural district were studied for composition and constitution. The stands fall roughly into 3 types: genuine selection forest, stands in which the selection system is endangered, and stands formerly managed under a selection system that has now lapsed. Silvicultural problems are discussed. The ideal stand should have 600–700 stems/ha. (> 6 cm. d.b.h.) of a group-wise mixture of 50% Silver Fir, 40% Spruce and 10% broadleaved species, giving a growing stock of ca. 600 cu.m./ha., of which ca. 8–10 cu.m./ha. should be removed annually.

3878. DANNECKER, K. Lehrreiches aus dem schwäbisch-fränkischen Wald. [Instructive observations from the Swabo-Franconian forests.] *Schweiz. Z. Forstw.* 108 (3), 1957 (163–74). 5 refs. [G.f.]

Describes, with examples, ca. 30 years' work towards converting (a) primitive selection forests, (b) other existing mixed forests, and (c) degraded even-aged forests (all Silver Fir, Spruce, and hardwood mixtures) into highly productive, fully stocked selection forests, with particular attention to the needs of Fir, and the building up of forest forms resistant to gales, snow, insects etc.

3879. WIEDMER, F. Plenterung im Fichtenwald. [The selection principle in Spruce forests.] *Schweiz. Z. Forstw.* 108 (3), 1957 (201–5). [G.f.]

The author discusses the merits and drawbacks of this form of management for natural pure Spruce forest of the *Piceetum subalpinum*. The conversion of even-aged Spruce forests into uneven-aged selection forests is recommended, provided that it is done very slowly and carefully.

3880. JABLANCZY, S., BARANYAY, J., and HENZEL, J. Szálalógazdálkodás a Szentgyörgyvölgyi es környéki volt paraszti erdőkben. [Selection fellings in former peasant forests of Szentgyörgyvölgy and its vicinity.] *Erdőmérnöki Főiskola Közleményei, Sopron* 1956 (1), (47–72). 17 refs. [Hu.hu.russ.g.]

In 1954 it was realized that a considerable extent of small forests in Hungary had been managed since time immemorial under selection fellings. More than 3000 ha. of this type were then taken over by the Sopron School for research into the selection system. This paper describes these forests, with maps, profile diagrams, and histograms of growing-stock distribution by species (Scots Pine, Oak, and Beech) and diameter classes.

3881. SUSMEL, L. Tipo culturale per le faggette meridionali. [A silvicultural system for southern [Italian] Beech woods.] *Monti e Boschi* 8 (4), 1957 (161–75). 12 refs. [It.f.e.]

Detailed proposals for treating these woods, in a region with prolonged summer drought, by group

selection felling, the groups not exceeding 250–400 sq. m. in area. The Beech reproduction should be under cover only for the first 20–25 years.

3882. SANDER, I. L., and WILLIAMSON, M. J. Response of a mixed hardwood stand in eastern Kentucky to a harvest cutting. *J. For.* 55 (4), 1957 (291–3).

A main felling, made in 1923 in plots totalling 5½ acres in a mixed hardwood stand of *Quercus rubra*, *Carya* spp., *Acer saccharum*, *Tilia americana* and other species, removed ¼ of the b.a., these four making up 70% of the total volume removed. After 32 years the b.a. had increased by 3 times and the volume by 5, whereas on control plots where no felling was made b.a. increased only by 1.5 and volume by 1.6 times. Sugar Maple is now predominant in the stand, although Red Oak has a larger volume increment and shows better form.

222. Coppice, Pollarding and Lopping Systems See No. 3883.

226. Changes of Silvicultural System. Conversion (by System or Species)

See Nos. 3878–9.

3883. PREMUDA, G. La conversione dei boschi cedui di faggio in fustaia nelle Foreste Demaniali Pistoiesi. [The conversion of Beech selection coppice to high forest in the state forests of Pistoia.] *Monti e Boschi* 8 (3), 1957 (109–14). [It.f.e.]

The conversion of Beech selection coppice to Beech and Silver Fir high forest is being effected on a large scale in the Pistoian Apennines. By periodic thinning of the shoots and partial removal of stools in 3 felling cycles at 8, 16, and 24 years, a new stand is obtained, originating mainly in suckers that have formed their own roots and have thus the characteristics of seedlings. At the time of the 3rd thinning, transplants of *Abies alba* are interplanted. This relatively quick and easy form of conversion is based on the capacity of Beech in the Apennines to regenerate vigorously from suckers.

3884. FODOR, G. Állományápolási kísérletek. [Stand conversion experiments.] *Erdész. Kutatás., Budapest* 1956 (2), (93–108). 9 refs. [Hu.russ.e.g.]

Soil and vegetation indications and financial prospects justify the following trial methods of conversion which may play an important role in Hungarian forestry: Oak/Hornbeam on weak podzols was converted (a) into groups of Oak (sown direct) and Scots Pine (planted) to which some Lime and Chestnut will be added; (b) on northern aspects, to *Abies* and *Larix* with *Q. rubra* var. *maxima* and some *Acer pseudoplatanus*; (c) on lower ground, by planting Spruce in gaps 10 m. across and spaced 40 m. apart, these gaps being extended gradually and Beech being meanwhile underplanted outwards from their periphery. Coppice Hornbeam provides an additional storey.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See Nos. 4057, 4059–60, 4167, 4204, 4401.

23. Regeneration and Formation of Stands

See also No. 4168.

3885. BEDELL, G. H. D.; CALDWELL, E. R.; MORRISON, M. B. The future of Eastern White Pine in Canada. *For. Chron.* 33 (1), 1957 (32-45).

Three papers from a symposium on the subject, dealing mainly with available supplies and results of research on regeneration.

3886. BOTHWELL, J. E. The future of Birch from the viewpoint of the veneer industry [in Canada]. *For. Chron.* 33 (1), 1957 (22-4).

Discusses present supplies, probable regeneration, and use of White Birch as a substitute for Yellow Birch.

231. Natural Regeneration

See also Nos. 3794, 3827-8, 3856, 3875-6, 3881, 4037, 4078.

3887. DÉRFÖLDI, A., and SZÁSZ, T. A felújítást biztosító fakitermelési és vágásmódok vizsgálata tölgy- és bükkállományokban. [Examination of logging methods ensuring regeneration in Oak and Beech stands.] *Erdész. Kutatás., Budapest* 1956 (2), (3-37). 11 refs. [Hu.russ.e.g.]

A detailed review, based on a country-wide survey, was made of felling, conversion and extraction methods of Hungary, in order to determine those that do not diminish soil fertility or regeneration, or cause excessive damage to the residual stand despite large-scale mechanization. Long-term experiments have now been laid down to answer outstanding questions, including the value of the increment in the shelterwood during the regeneration period. The principal impediment to improved practice is the general lack of planning in the location and sequence of felling areas.

3888. FISCHER, D. Maschinen für die Bodenbearbeitung zur Vorbereitung der natürlichen Verjüngung. [Machines for soil cultivation preparatory to natural regeneration.] *Forstarchiv* 27 (10), 1956 (239-40). [G.]

A description, illustrations, and technical data, are given for two cultivators and two harrows of German make and one Finnish harrow, all particularly suited for forestry use. The Hessischer Anbaugrubber is a cultivator designed as a tractor attachment.

3889. Kauri regeneration beneath a mature stand. *Newslett. N.Z. For. Serv.* 7 (3), 1957 (3).

In 1936 all ground vegetation was cleared from a plot (2 × 1 chains) on a 35° slope beneath a mature stand of Kauri [*Agathis australis*]. At that time there were 42 Kauri seedlings present, and a year later there were 130 seedlings, which were pegged. In 1956 the plot was completely covered with tussock-grass 6 ft. high and there were 1260 Kauri seedlings all ≤ 3 ft. high, the original seedlings having all disappeared. The majority of the present seedlings are to be found on old rotten wood, rotten cut stumps, or the heaps of shed bark at the base of the parent trees.

3890. PALL, E. Az erdeifenyő állományok természetes felújítása a göcseji fenyőrégióban. [Natural regeneration of the Scots Pine stands in Göcsej.] *Erdész. Kutatás., Budapest* 1956 (3), (127-43). [Hu.russ.e.g.]

The following types of Pine stand are distinguished: (1) with shrub layer; (2) with hardwood understorey; (3) with mixed hardwoods; (4) with Beech. In (1) and (2) the hardwoods must be replanted, but the Pine regenerates naturally. In (3) and (4) both hardwoods and Pine regenerate naturally, the former in group-felling openings, the latter after a uniform seeding felling and soil working to destroy raw humus. Seed trees are removed in the second year. An average of 5 seedlings/sq. m. is to be expected. Costs are 30% cheaper than planting.

3891. [Felling methods, slash and natural regeneration in coniferous swamp forests.] *Rep. Lake St. For. Exp. Sta.* 1956 [1957] (47-8).

In a Black Spruce swamp forest, regeneration varied widely with seedbed types; sphagnum mosses and burnt duff were good, and feather (*Hypnaceae*) and *Dicranum* mosses and raw litter, poor seedbeds. Sphagnum mosses covered 39% of the area and accounted for 91% of the seedlings, while raw litter covered 14% and bore no seedlings. Where slash was left in windrows, raw litter made up 38%, when it was thrown off the strips 3%, and when burned 10%, of the seedbed area after 3 years. In two mixed coniferous swamps, after regeneration fellings by clear-felling, diameter-limit, shelterwood and light-selection methods, amount of slash was closely related to volume cut, the slash-free area ranging from 29.8% on clear-felled areas to 60.3% in light-selection areas. Dense slash has a harmful effect on advance growth and establishment of new seedlings in these swamp forests.

3892. The important place of seedbed scarification in the regeneration of Shortleaf Pine on the Piedmont. *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (64-5).

In 3 test areas in N. and S. Carolina the number of seedlings at the end of 1 year on scarified strips (a) was 7 times that on intervening non-scarified strips (b). At the end of the first growing season, (a) were covered with medium or heavy brush to the extent of only 1 quarter, as against two-thirds on (b).

3893. SILKER, T. H. Prescribed burning in the silviculture and management of Southern Pine/hardwood and Slash Pine stands. *Proc. Soc. Amer. For.* 1956, 1957 (94-9). 14 refs.

Reviews research done on the use of prescribed burning to reduce competition from hardwoods to Pine regeneration. Details are given of the conditions in which burning can be safely done, and precautions to be taken.

3894. LAVENDER, D. P., BERGMAN, M. H., and CALVIN, L. D. Natural regeneration on staggered settings. *Res. Bull. Ore. Bd. For.* No. 10, 1956. pp. 36. 9 refs.

Patch logging, or 'staggered setting' has been practised for some time in the Oregon Douglas Fir

region, and this report deals with an investigation of natural regeneration on 13 such areas, 4-11 years old at altitudes of 1500-4000 ft. For the purposes of the study, a staggered setting was defined as a cut-over area < 160 acres in extent and completely surrounded by timber. On these areas a total of 3241 milliacre plots were examined, the following data being recorded for each: number, age, and species of coniferous reproduction; distance from seed source; intensity of burn; density and type of ground cover; amount of slash; seedbed conditions; and aspect. The effect of each of these factors was evaluated by statistical analysis of the field data. The results indicated that there was no correlation between patch size and distance from seed source, and little correlation between distance from seed source and occurrence of coniferous reproduction. For a given milliacre plot, the following environmental factors are favourable to the establishment of coniferous reproduction: no burn, northerly aspect, light slash cover, light herbaceous cover. The following factors are unfavourable; any degree of burn, southerly aspects, medium or heavy slash, and heavy herbaceous cover or woody-plant cover.

3895. Proper seedbed preparation favours Yellow Birch reproduction. *Rep. Lake St. For. Exp. Sta. 1956* [1957] (53-4).

Seedbed scarification increases the catch of seedlings and enhances survival and early growth. Number of seedlings 3 years after diskings is correlated with the % of mineral soil exposed, exposure of 75% giving the highest stocking, survival and growth. Moderate felling of the overstorey, leaving a stand heavy enough to give 50% shade, is effective in increasing height growth of seedlings and reducing grass and shrub competition.

3896. CIRIN, A., and ANCA, A. Regenerarea salcîmului din sămînță pe cale naturală. [Natural regeneration of *Robinia pseudoacacia* from seed.] *Rev. Pădurilor* 70 (11), 1955 (537-9). 1 ref. [Rum.]

Abundant natural regeneration from seed occurs in most years in Robinia stands but, under a mature stand, dies out at 1-2 years. Under sucker growth it does better, but begins to languish at 2-3 years. A controlled burn in the spring after clear felling is recommended; seed left in the ground then germinates and develops without competition.

3897. MARION, J. Semis spontané d' *Eucalyptus camaldulensis* dans la région de Rabat. [Natural regeneration of *E. rostrata* in the Rabat region.] *Bulletin de la Société des Sciences naturelles et physiques du Maroc, Rabat* 36 (2), 1956 (97-102). 3 refs. [F.]

Quotes instances of natural regeneration on sandy, non-calcareous soils after opening up pure stands or mixtures with Pines, occurring within the stand or spreading into cultivation. Suggests that a cereal nurse crop will ensure the establishment of direct sowings by reducing other competition.

3898. MIGUET, J. M. Mise en valeur et régénération de la forêt de tamarin des hauts en zone tropicale d'altitude: la Forêt de Belouve à la Réunion. [Exploitation and regeneration of *Acacia*

heterophylla forest in the tropical montane zone: the Forest of Belouve on Réunion.] *Rev. for. franç.* 9 (4), 1957 (285-310 + plate). [F.]

Describes the plateau forests of Réunion, consisting largely of *Acacia heterophylla*. The approved method of exploitation is clear felling at the beginning of winter. As soon as warm weather begins, but before the beginning of the rains, the logging debris is windrowed and the whole regeneration area raked over so as to distribute evenly, to a depth of 20 cm. the *voune*, a thick layer of raw humus that accumulates under *A. heterophylla*. The sequel to this treatment is usually a dense crop of *A. heterophylla* seedlings that are gradually thinned to the desired density. Where *A. heterophylla* constitutes little of the original stand, there will be only a thin layer of humus; here the method employed is light raking following by broadcast sowing of *A. heterophylla* seed. The second part of the paper describes the use of Lasso-cableways to extract timber from this high plateau forest.

3899. [Methods of obtaining natural regeneration in the Western Region of Nigeria.] *Rep. For. Res. Nigeria 1955/56, 1957* (7-8).

An experiment was set up in 1952 to test three methods of obtaining natural regeneration: (a) tropical shelterwood system as originally prescribed, (b) annual climber cutting only, (c) felling and burning all growth except seed trees. The results after 3 years showed that (a) had been fairly successful, producing in the sample plot an average of 71 seedlings of economic species per acre, 54 of which were *Terminalia superba*, and 67 of which were > 3 ft. high. There was also a considerable amount of regeneration of *Sterculia rhinopetala*; (b) was definitely unsuccessful, producing only 24 economic seedlings per acre, and as 16 were present in 1952, the increase was very small; (c) made a promising start with 130 economic seedlings per acre, but 101 of these were *Sarcocephalus diderrichii* which after 3 years were looking unhealthy and suppressed. For these conditions a strong light-demander like *S. diderrichii* will probably only succeed with much more space and light than it has had, and a large amount of cleaning and complete riddance of *Musanga* would be necessary from the start.

Another investigation begun at the same time was designed to compare methods of obtaining natural regeneration of *S. diderrichii*. The operation consisted of climber cutting, poisoning of all un-economic trees not too big to poison, and removal of debris, followed by (1) no further treatment except cleaning, (2) broadcasting of *S. diderrichii* seed, and (3) hoeing of the soil and broadcasting of seed. Considerable quantities of regeneration were obtained by all methods, but (3) produced no more than the others. It is clear that given bare soil to germinate on and plenty of light, regeneration of *S. diderrichii* and *Terminalia superba* can be obtained fairly easily.

3900. [Regeneration of *Khaya grandifoliola* in forest outliers.] *Rep. For. Res. For. Sch., Nigeria 1954/55, 1957* (9-10).

Investigations are in progress to determine the best way of inducing natural regeneration of valuable species in *kurmi*-type forest [patches of high forest on a stream bank, and surrounded by savanna or grassland], and assisting advance regeneration. Three site types based on soil moisture are recognized; they run more or less parallel with the length of the *kurmi* and the stream, becoming progressively drier as the outer limits of the *kurmi* are reached. Five $\frac{1}{4}$ -acre plots were laid out, in the direction of the harmattan, across the *kurmi* so that they included samples of all 3 site types, and seedlings were enumerated, with particular attention to *Khaya grandifoliola*, the commonest economic species of the S. Guinea zone. It was found that the most abundant regeneration of *K. grandifoliola* occurred on the outer edges of the *kurmi* and particularly on the leeward side. The plot in the middle of the *kurmi*, near to the stream, contained no *Khaya* seedlings. On these internal moist sites there is usually a dense shade cast by the dominant trees, which form an almost continuous canopy. The distribution of *K. grandifoliola*, which is a light demander, appears to be largely influenced by light intensity rather than soil moisture.

3901. **Kurmi and relic forests.** *Rep. For. Res. Nigeria 1955/56*, 1957 (11-2).

[Cf. preceding abstract.] Conclusions to date are: (1) Where mother trees of *K. grandifoliola* and *Chlorophora excelsa* appear in the forest matrix, the removal of heavy shade-bearing species occurring beneath an upper canopy greatly assists in the recruitment of these two economic species. (2) Where the *kurmi* borders on the savanna, the canopy should be left alone, as it tends to be at an optimum for *K. grandifoliola* regeneration. (3) Owing to the time lag between the trees being poisoned and the canopy opened, poisoning is best done during and towards the end of the dry season, so that robust seedlings may be developed before the onset of the following dry season. Unfortunately this season is a time when the *kurmi* offers the only safe cover for game, and many are killed through licking the girdles. (4) Full fire protection round a *kurmi* will assist its spread into the savanna, with *K. grandifoliola* amongst the pioneer species.

3902. [Regeneration of degraded savanna forest.] *Rep. For. Res. For. Sch., Nigeria 1954/55*, 1957 (8).

Experiments are being made in methods of densifying degraded savanna forest in the Northern Region of Nigeria. Three 1-acre plots were demarcated, which included *Isobrerlinia dalzielii*, *I. doka*, *Terminalia avicennioides*, *Monotes kerstingii* and *Gardenia erubescens* as type trees. In July 1954 three treatments were carried out: (1) coppicing everything, (2) coppicing and removal of stumps > 1 in. diam., leaving lateral roots, (3) as (2) but with disc ploughing of the whole area. In Feb. 1955 the plots were assessed by counting the number of coppice shoots and seedlings. Provisional conclusions are that (1) produces the most vigorous coppice regrowth, especially for *Isobrerlinia* spp. It is too soon to decide whether stump removal

produces denser stocking, but disc ploughing appears to be too drastic; better results might be obtained with a disc harrow.

232. Artificial Regeneration

See also No. 3762.

3903. PARRY, M. S. **Progress with hardwood replacement in Tanganyika.** Government Printer, Dar-es-Salaam. 1957. pp. 12. 3 refs. (Seventh British Commonwealth Forestry Conference, Australia and New Zealand, 1957.)

On the artificial regeneration of *Chlorophora excelsa*, *Ocotea usambarensis*, *Olea welwitschii*, and *Pterocarpus angolensis*.

3904. GOES, E. DA S. REIS. **Nursery and planting techniques [for Eucalypts].** *Summary in Final Rep. World Eucalyptus Conf., Rome 1956*, 1956 (116-8 + 1 set of drawings). [E.]

Discusses selection of seed and seed trees, soil and water requirements in the nursery, spacing in nursery and plantation, bare-root, pot and ball planting (including balling machines), time of sowing and transplanting, chiefly on the basis of Portuguese and Mediterranean experiences.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 3651, 3840, 4204, 4809, 4835.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 3740, 3764, 3873-4, 4509, 4795.

3905. GINDEL, J. **Acclimatization of exotic woody plants in Israel: the theory of phyto-plasticity.** *Mater. veg.* 2 (2), 1957 (81-101). 11 refs. [E.f.] E.M.B.

As the result of 20 years' experience in the introduction of exotic woody species, the author introduces the theory of 'phyto-plasticity', i.e. that the conditions of a new environment stimulate the ability of plants to adapt themselves. Information is presented on the climate of Israel and the reaction of certain species in adapting themselves to changed conditions of temperature, precipitation and phenology, with some practical recommendations for methods to be used when introducing exotics.

3906. PARRY, M. S., and WILLAN, R. L. **Tanganyika: exotic forest trees in the British Commonwealth.** Statement prepared for the Seventh British Commonwealth Forestry Conference. Government Printer, Dar-es-Salaam. 1957. pp. 28.

3907. WENDELKEN, W. J. **Trials with exotic tree species in high country.** *N.Z. J. For.* 7 (3), 1956 (76-86). 3 refs.

Tree planting at high levels in New Zealand is reviewed, details being taken from two regions in the North Island and four in the South Island. Both conifers and broadleaved trees from Western America and Europe show promise at middle levels up to 4000 ft. There is, as yet, insufficient evidence to indicate critical altitudes and sites for the species tried so far. Further ecological investigations with both indigenous and exotic species are indicated

before the problems involved in revegetating mountain catchments can be solved. *Author's summary.*

3908. KOSTURKIEWICZ, A., and MEIXNER, J. *Chamaecyparis lawsoniana* Parl. i *Thuja plicata* Lamb. na terenie nadleśnictwa państwowego Łopuchówko. [*C. lawsoniana* and *T. plicata* in the Łopuchówko forest district [Poland].] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 11, 1956 (195-224). 17 refs. [Pol.russ.e.]

Gives the results of measurements in 1900, 1926 and 1954, in stands now 60-70 years old. *C. lawsoniana* has done poorly in Poland, *T. plicata* much better. Both are susceptible to *Fomes annosus*.

3909. HEIKINHEIMO, O. Ulkomaiset puulajit Suomen metsätaloudessa. [*Exotic tree species in Finnish forestry.*] *Pap. ja Puu* 39 (4 a), 1957 (211-6). [Fie.] P.R.

The oldest plantations of exotics date from 1842 and the majority from 1870-1900 or 1925-40. In 1954, 790 ha. on state-owned land were planted with exotics. Of the new conifers only *Larix sibirica* and *L. decidua*, *Pinus contorta* var. *latifolia* and perhaps *Larix gmelini* vars. *olgensis* and *japonica* and *L. leptolepis* can be recommended. Larch often achieves a better volume growth than *Pinus sylvestris* and provides durable timber for e.g. poles and railway sleepers, and its hybrids grow rapidly. Lodgepole Pine has given considerably higher yields in Finland than domestic conifers and is suitable for chemical pulping. Experiments with e.g. Douglas Fir must be continued before reliable conclusions can be drawn. Certain Poplars grow fairly well, but need better sites than the normal forest sites. *Populus tremula* × *P. tremuloides* hybrids are less demanding and thrive on slightly poorer land. *From author's summary.*

3910. MIEGROET, M. VAN, and JANSSENS, F. Aufbau und Wachstum von Beständen der Wald-föhre und der Korsikanischen Schwarzföhre in Nord-Belgien. [*Structure and growth of stands of Pinus sylvestris and P. nigra* var. *calabrica* in northern Belgium.] *Forstwiss. Cbl.* 75 (9/10), 1956 (458-68). 13 refs. [G.]

Comparisons were made, on 24 trial plots of 25 × 25 m., of the quality, structure, growth and stocking of pure stands of Corsican and Scots Pine on sandy soils in different districts of N. Belgium. In growth, yield, quality, stem form and number of élite trees, Corsican Pine has a marked superiority, and, in addition, increment does not fall off at 40-50 years as in Scots Pine. Corsican is however more branchy in growth habit, forms a thick raw-humus layer in pure stands, while as yet no satisfactory mixture has been devised, and is more susceptible to attack by *Crumenula pinicola*.

3911. CAZACU, N. N., and VASU, V. Unelele rezultate in cultura pinului alb (*Pinus strobus* L.) la oraşul Stalin. [*Some results from trials of P. strobus* at Stalin [Rumania].] *Rev. Pădurilor* 70 (11), 1955 (528-30). [Rum.]

In a 45-year-old plot, planted at 3 × 3 m., mean d.b.h. is 32 cm., mean height 30 m., and form good.

3912. FURNICĂ, H., and ENESCU, V. *Larix leptolepis* Gord. şi *Larix decidua* Mill: rezultatele obţinute în încercarea de cultură din apropierea oraşului Rîşnov. [*Results of trial plantations of L. leptolepis and L. decidua* in the neighbourhood of Rîşnov.] *Rev. Pădurilor* 70 (11), 1955 (522-7). 3 refs. [Rum.]

Gives data on rainfall and increment in these plantations, established in 1915 at an altitude of ca. 800 m. in the Beech zone. European Larch did rather better than Japanese; at 40 years of age, mean d.b.h. was 13 cm. (12.8), mean height 15.4 m. (14.2), volume 96.4 cu. dm. (95.1), and form factor 0.47 (0.51). Figures in parenthesis refer to Japanese Larch.

3913. SCHWABE, G. H. Algunas observaciones sobre el crecimiento de *Pinus radiata* Don. en Mininco. [*Some observations on the growth of P. radiata* in Mininco.] *Boletín de la Sociedad de Biología de Concepción, Concepción* 28, 1953 (129-40 + 1 plate). [Span.span.g.e.] C.P.S.

Presents a picture of growth rhythm based on measurements taken at 6 different dates over the years 1951-1953 from 268 trees planted in August 1950. Factors influencing their development are discussed, in particular, water economy and its role in the development of the many and frequent diseases caused in this species by the regional climate.

3914. CALDART, F. Risultati di un esperimento sull' impiego di conifere esotiche. [*Results of an experiment in the use of exotic conifers.*] *Monti e Boschi* 8 (3), 1957 (115-9). [It.f.e.]

Describes a small experimental plot of *Abies cephalonica*, *Cedrus atlantica* and *Cupressus sempervirens* in the southern zone of the *Lauretum* in the Venetian pre-alps. In spite of unfavourable conditions and lack of tending, results are good. [Cf. F.A. 12 Nos. 1103, 1955.]

3915. TUCOVIĆ, A. Čempres (*Cupressus sempervirens* L.) u Beogradu. [*C. sempervirens* in Belgrade.] *Šumarstvo* 9 (1/2), 1956 (45-52). 9 refs. [Serb.e.f.]

Of 35 *C. sempervirens* trees planted in Belgrade 27 years ago, 2 have survived; the lowest temperature over that period was -24° C. in 1947. Seeds from these trees were sown in 1955, of which 11% germinated.

3916. VINOGRADOV, V. N. O roste posevnogo kaštana (*Castanea sativa* Mill.) v lesnyh kulturah na Podolii. [*The growth of C. sativa* in tree plantations in Podolia.] *Bot. Ž.* 41 (7), 1956 (1035-7). 4 refs. [Russ.]

In 1939 in the Pliskovsk forest, Ukraine, experiments were made on 2 plots of ca. 1 ha., planting Chestnut in mixture with Oak, Ash, Maple and Hornbeam at 1.5 × 0.5 m. spacing. Data on mean height and diam. after 15 years are tabulated. Chestnut grew better than Oak but not as well as Ash, and started to fruit after 11 years. In the first years some of the seedlings suffered from frost but hardiness increased with age.

3917. BARABITS, E. A tulipánfa. [The Tulip-tree.] *Erdész. Kutatás., Budapest* 1955 (1), (99-106 + smries in suppl.). [Hu.russ.e.g.]

Hitherto grown mainly as a park tree, *Liriodendron tulipifera* deserves planting in Hungary (for veneer bolts) on floodlands, lower Beech zones and river banks where Poplars have failed. There are trial plantations on floodlands at Ivánc, Fertőd and Ugod. Nursery practice is briefly discussed.

3918. PIŠKORIĆ, O. Prilog poznavanju mogućnosti uzgoja eukalipta kod nas. [Possibilities of growing Eucalypts in Yugoslavia.] *Šum. List* 80 (3/4), 1956 (111-20). [Croat.]

Presents some data on the acclimatization in Yugoslavia of *E. amygdalina*, *E. rostrata*, *E. globulus* and *E. viminalis*, the seeds of which were brought in 1948 from the Caucasus. These were dealt with in exactly the same way as other small seeds. Germination (early May) was as good in the germinator as in the open. In the first half of June the seedlings were pricked out from the germinator into the nursery. The heights of plants of the last 3 species in August and October are tabulated, and also the numbers that died. The survivors (most of them transplanted to another site) all suffered more or less from frosts, winds and drought; most of them died in the winter of 1953-54. The d.b.h. and heights of 75 six-year-old trees are tabulated. *E. globulus* and *E. rostrata* had a mean d.b.h. of 13-14 cm. and a mean height of ca. 10 m. The author believes that *E. rostrata*, which in some cases produced coppice shoots from 'dry' stems, might be the right species for further acclimatization tests on the Adriatic littoral of Yugoslavia.

3919. VRDOLJAK, Z. O mogućnosti uzgoja eukalipta u našem primorju. [The possibility of growing Eucalypts in the littoral of Yugoslavia.] *Šum. List* 80 (5/6), 1956 (143-54). 9 refs. [Croat.f.]

Climatic conditions (mean annual temperature and temperature extremes; annual precipitation) in the littoral of Yugoslavia closely resemble those in S.E. Australia (New South Wales and Victoria). First attempts (unsuccessful) at introducing Eucalypts there were made in 1868. Except for the very recent attempts at acclimatization, Eucalypts growing in Yugoslavia are found in parks, sometimes in groups of 60-100 trees, mostly *E. globulus* and *E. rostrata* (some of them 50 years old), the latter sometimes regenerating naturally. In 1954 these species withstood temperatures as low as -7°C . Since there are Eucalypt species that can withstand much lower temperatures, the author advocates further comprehensive trials in order to determine the species most suitable for Yugoslavia.

3920. [Development and growth habit of Eucalypts in S. China.] *For. Sci., Peking* 1 (1), 1955 (47-90). [Chin.]

Eucalypts were introduced to China via Hong Kong > 60 years ago. The course of their spread is briefly traced. In 1954, at the instance of Russian specialists, a great expansion of Eucalypt planting was begun in 5 provinces of S. China. Meanwhile an inventory of all species existing in China was made in June-Oct. 1954. Despite the authoritative

statement that only 12 Eucalypt spp. had previously been recognized, Professor K. S. How of the S. China Botanical Institute collected specimens of 40 species, of which 26 were identified; and another 11, so far unnamed, were added during the inventory. The results of this inventory are given in some detail for *E. robusta*, *E. maculata*, *E. rostrata*, and *E. tereticornis* (distribution, characteristic features, environmental factors, habit of growth, morphology); the two latter species are reported to withstand temperatures down to -7°C . Some Eucalypts (unspecified) have been used as sleepers for > 20 years. Some growth data for *E. robusta* (up to 38 years old) felled in different locations are tabulated.

3921. NANJUNDAPPA, D. A note on Eucalyptus plantations in old Mysore State. *Indian For.* 83 (4), 1957 (280-6 + 4 photos).

More than 5300 acres of Eucalypt (mainly *E. citriodora*) plantations have been established in Mysore. Some account is given of methods employed and costs of establishment.

3922. PIERLOT, R. Value of Eucalypts, tropical Africa. *Summary in Final Rep. World Eucalyptus Conf., Rome* 1956, 1956 (70). [E.]

Deals with the results of plantings in the Belgian Congo and Ruanda-Urundi, chiefly for firewood and poles, also mine timbers and essential oils, discussing choice of species by climatic type, planting methods, rotations and yields. Coppice rotation of 4-10 years is most frequent. In the well watered mountainous regions without excessive dry seasons, a m.a.i. of up to 40 cu.m./ha. has been recorded.

3923. GRIFFITH, A. L. Value of Eucalypts—East Africa. *Final Rep. World Eucalyptus Conf., Rome* 1956, 1956 (71-5). [E.]

Gives data for Kenya, Uganda, Tanganyika and Zanzibar, partly extracted by FAO staff from these colonies' reports, on the extent, location, and purpose of plantations, species used, growth, yield and rotations for the most important species, including data from 22- to 24-year-old trial plots. Drawbacks (low recovery of timber, susceptibility to termites and *Gonipterus scutellatus*) are also discussed.

3924. METCALF, W. The value of Eucalypts. Eucalyptus trees in the United States. *Final Rep. World Eucalyptus Conf., Rome* 1956, 1956 (91-6). 14 refs. [E.]

Deals chiefly with the history and development of *Eucalyptus* planting in California, species introduced, utilization, including chipping of *E. globulus* for pulp, with notes on species found, chiefly as shade trees, in Arizona, Florida, and the Gulf states.

3925. FLINTA, C. M. The value of Eucalypts. Latin America. *Final Rep. World Eucalyptus Conf., Rome* 1956, 1956 (76-83). [E.]

Deals with the extent of plantings of various species in various parts of S. and Central America under widely different climatic and ecological conditions, purposes, including shelter plantings, yield and growth data, etc.

3926. MANGIERI, H. Resultados del cultivo de *Eucalyptus marginata* en Misiones, Argentina. [The results of the cultivation of *E. marginata* in Misiones, Argentina.] *Rev. for. argent.* 1 (1), 1957 (25-7). 5 refs. [Span.]

E. marginata is in process of being tried out in Misiones, El Chaco, Entre Rios and Corrientes. Promising figures are given for diameter and height of 2-year-old trees at the Estación Forestal de Leandro N. Alem (Misiones).

3927. CARRERAS, A. DE LAS. Observaciones sobre el comportamiento de *Eucalyptus viminalis* en la provincia de Buenos Aires, Argentina. [The behaviour of *E. viminalis* in Buenos Aires province, Argentina.] *Rev. for. argent.* 1 (1), 1957 (5-9). 5 refs. [Span.]

Notes on its silvicultural requirements, growth habit, enemies and pests, with data on average height and diameter, b.a. and volume/ha. and volume m.a.i./ha. in 3 stands in Buenos Aires aged 7, 8, and 45 years respectively.

3928. CHIZZALI, F. Resultados de 5 años de forestación con Salicáceas, en tierra firme, en la provincia de Santa Fé. [Results of 5 years' afforestation with Salicaceae on dry land in Santa Fé province.] *Rev. for. argent.* 1 (1), 1957 (15-25). [Span.]

The study was made on a private estate of 1300 ha., of which 900 ha. have been planted with cuttings of $\times$ *Populus* 'canadensis' and *Salix alba* var. *caerulea*. Information is given on climate, soils, provenance, and planting methods. An initial spacing of ca. 1111 plants/ha. is recommended, followed by thinnings between the third and fourth year, reducing the stock to 600-550, and two or three years later to 350, or, at most, 450/ha. The tending of the plantations, pruning, and felling methods, the most important pests and diseases and other causes of injury (including fire) are described, and some figures are given for yield to date.

3929. [Comparative growth of *Swietenia mahagoni* and *S. macrophylla* in the Seychelles.] *Rep. Dep. Agric. Seychelles* 1955, 1956 (14).

Both species are doing well in experimental plantations, but *S. macrophylla*, though slightly inferior in girth increment, is much superior in height and stem form.

232.12. Races and Provenance Trials

See also Nos. 3964, 4795.

3930. RUBNER, K.; SCHÖNBACH, H. Ergebnisse eines heute 20jährigen Fichtenherkunftsversuches. I. Teil. Die Fläche in Bayern. II. Teil. Die Flächen in Thüringen und Sachsen. [Results of 20-year Spruce provenance trials. I. The Bavarian trial plot. II. The trial plots in Thuringia and Saxony.] *Silvae Genet.* 6 (3/4), 1957 (65-91). 27 refs. [G.g.e.f.]

Reports on 3 out of 7 trial plots set up in 1936, viz. (1) Saxony (Tharandt Forest) at ca. 365 m. altitude, (2) Thuringia (Oberstadt ca. 630 m.), and (3) Bavaria (Bischofsreut, ca. 1000 m.). In (3) best height growth was made by the provenances from Partenkirchen (Bavarian Alps, 850 m. alt.) and E. Prussia (135 m.) and the Erzgebirge (Carlsfeld). The

Riesengebirge and the Glatz provenances were much inferior in growth, though superior to the Sachsenried provenance (Bavarian Alpine foothills, 840 m.). In (1) the Erzgebirge provenance Komotau (800 m.) and the Glatz provenances (710-900 m.) grew best, followed by the E. Prussian provenance. The Partenkirchen (850) and Sachsenried (840 m.) provenances made the least growth. Results in (2) were similar to (1). In all 3 plots, therefore, the E. Prussian and Erzgebirge provenances proved good to excellent, while the Sachsenried provenance was left far behind. *From authors' summary.*

3931. BOUVAREL, P., and LEMOINE, M. L'expérience internationale sur les provenances d'épicéa (*Picea excelsa* Link.). Quelques résultats obtenus en France concernant notamment une attaque de némates (*Lygaenematus abietinus* Christ.). [The international Spruce provenance trials. Some results obtained in France with particular reference to an attack by *Pristiphora abietinalis*.] *Silvae Genet.* 6 (3/4), 1957 (91-7). 4 refs. [F.f.g.e.]

Seed from regions of about the same latitude as Nancy, where the trials are taking place, and from the lower part of the altitudinal range of Spruce, gave the best total height growth. Balkan and Scandinavian provenances gave poor results. The northern and sub-alpine provenances are the first to flush and are therefore the most sensitive to spring frosts. A strong negative correlation exists between early flushing and susceptibility to insect attack. *From authors' summary.*

3932. JOHNSON, H. Utvecklingen i 15-åriga försöksodlingar av tall i relation till proveniens och odlingsort. [Development in 15-year-old Pine trial plantations in relation to provenance and site.] *Svenska Skogsvärdn. Tidskr.* 53 (1), 1955 (59-88). 12 refs. [Sw.sw.]

Progeny from 79 trees from 24 sites in latitudes ranging from 57° 35' to 65° 39' N. were used in trials at Boxholm (58° 10'), Dalfors (61° 18'), and Rörström (64° 13'). Results are given in tables and graphs. General conclusions are that trees of southern provenance grown in the north generally show higher increment, especially in volume and diameter, and that the reverse is true for northern provenances moved to the south. There are, however, considerable differences in the reaction of provenances from the same district. Southern provenances suffered a high mortality in northern plantings, to such an extent that, in spite of their higher increment, their yield per unit area was lower than that of local provenances. This is attributed to their greater susceptibility to snow blight [*Phacidium infestans*]. Northern provenances survive better when moved south; their somewhat increased mortality is attributed to their poorer growth, which makes them less able to compete with grass and shrubs. It is concluded that the maximum distance between seed source and planting site should be two degrees of latitude or 20 [Swedish] miles, and that this should be reduced to allow for difference in altitude. Graphs are given showing the relation of provenance to stem volume and height development, up to the

first thinning, of branch diameter to d.b.h. and to crown diameter, and of crown diameter to d.b.h.

3933. LANGLET, O. Vidgade gränser för förflyttning av tallprovenienser till skogsodlingsplatser i norra Sverige. [Wider limits for moving Pine provenances to forest sites in N. Sweden.] *Skogen* 44 (9), 1957 (319). [Sw.]

A diagram is given illustrating the maximum recommended distances N. and S. and differences in altitudes for Pine seed provenance, assuming that a stand density of $< \frac{1}{4}$ to $\frac{1}{2}$ that of native provenances is essential. With the new limits, provenances can be moved up to 25 [Swedish] miles northwards or to 20 miles southwards, permissible distances varying with the magnitude of the change in altitude, and 300 m. up or 200 m. down, permissible changes varying with the changes in distances N. or S. These figures are derived from a series of plots on mossy Pine sites, planted with 2 + 0 or 3 + 0 plants, at spacings of 1.2 m. square or more. [Cf. F.A. 17 No. 2687.]

3934. NILSSON, B. Kvalitets- och produktionsförhållanden i ett klonförsök av tall. [Quality and yield in a trial of Pine clones [with a criticism by E. Andersson].] *Svenska SkogsvFören. Tidskr.* 54 (1; 2), 1956 (61-74; 209-10). 3 refs. [Sw.]

Measurements were made in 1954 in an experiment laid out in 1949 with *Pinus sylvestris* material grafted mainly in 1947. For the clonal material, measurements were made of height, diameter at half height, branch angle and thickness, diameter 3 cm. above the second or 3 cm. below the third whorl of branches, number of branches per whorl, and branch length; and, for the parent trees, height, diameter, bark thickness, age at breast height, diameters in the crown, and branch angle and thickness. Clones were divided into two groups, deriving from (1) 150-270 and (2) 300-420 metres altitude respectively. Graft material showed no difference in branch angle and thickness between the two groups, but parent material showed a slight tendency to a less acute branch angle and finer branches, with increasing altitude. Clones from (2) showed on average greater height for the same diam., and greater volume, but parent trees showed no such difference. For both clones and parent trees, tree form improved with increasing altitude. Material from 4 clones was grafted on stocks of *Pinus sylvestris* and of *P. mugo*; no significant difference was found between volume development on the two stocks. Slight positive correlations for branch angle and thickness, height at the same diameter and height in relation to branch angle, and a slight but not significant negative correlation for volume, were found between clone material and the parent tree. Conclusions are that differences exist between the clones and that on average there is a weak relationship between genotype (clone material) and phenotype (parent tree). E. Andersson criticizes the conclusions on the ground that the material and site were too varied, and not laid out for that type of study, and that other factors, e.g. damage from chemical weed control, affected the results.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.

3935. HARA, M., and TANAKA, K. [On the growth of cuttings of Poplars [obtained] by crossing in U.S.A.] *Transactions of the Tottori Society of Agricultural Science, Tottori* 10 (4), 1955 (30-3). 3 refs. [Jap.c.e.] C.G.B.

Tabulates results of experiments in Tottori with cuttings from 10 American hybrids, in respect of length and thickness of shoots, and number, length and thickness of shoots from cut-back rooted cuttings. Best growth results were those of OP 20 (*Populus charkowiensis* × *P. caudina*) followed by OP 285 (*P. nigra* × *P. trichocarpa*) and OP 41 (*P. maximowiczii* × *P. trichocarpa*). OP 44 (*P. maximowiczii* × *P. berolinensis*) was poorest, while OP-226 (*P. deltoides* × *P. caudina*) did not take root.

3936. RUBBO, R. Los álamos híbridos en el Uruguay. [Hybrid Poplars in Uruguay.] *Montes, Madrid* 13 (73), 1957 (16-8). [Span.]

Notes on the introduction of hybrid Poplars into Uruguay, with an estimate of the susceptibility or resistance to *Melampsora* spp. and *Septoria* spp. of 6 different clones, and recommends the founding of a Poplar Institute in Uruguay on the lines of that at Casale Monferrato in Italy.

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 4078, 4101.

3937. DERR, H. J. Effects of site treatment, fertilization and brown-spot control on planted Longleaf Pine. *J. For.* 55 (5), 1957 (364-7). 4 refs.

On clear-felled sites in the Palustris Experimental Forest, Louisiana, 4 methods of site preparation were applied in 1948 to $\frac{1}{4}$ -acre plots replicated 4 times. The treatments were (1) ploughing, (2) disking, (3) burning, and (4) burning and disking. The control plots were on 5-year-old grass. Planting was done in 1949; half the seedlings on each plot were sprayed with Bordeaux mixture twice annually for the first 2 years and annually for the next 2 years. Half of the sprayed and of the unsprayed seedlings were treated with 100 lb./acre, of a mixed fertilizer (superphosphate, potash, cottonseed meal and NH_4NO_3). The different site preparations did not significantly affect survival or growth after 4 years, though the lowest survival was on (3) and (4). The fertilizer reduced survival significantly by stimulating weeds and grasses, and failed to improve growth except on (1), where the seedlings planted in furrows were free from grass competition. Bordeaux mixture controlled *Scirrhia acicola* and substantially improved growth except on the fertilized plots. On the unsprayed plots height growth was checked. Control of *S. acicola* is essential in Longleaf Pine plantations.

3938. FERGUSON, E. R. Causes of first-year mortality of planted Loblolly Pines in East Texas. *Proc. Soc. Amer. For.* 1956, 1957 (89-92).

During the 1953-54 and 1954-55 planting seasons, *Pinus taeda* seedlings were planted out on wooded and open-field plots receiving a variety of treatments

(scalping, clear cutting, hardwood control, burning etc.). All treatments that reduced competition also reduced losses during the summer drought of 1954 (2-15% compared with 60-84% on controls); none of the treatments had much effect in the favourable summer of 1955.

3939. PUDDEN, H. H. C. *The Kenya shamba system. Rep. For. Dep. Kenya 1954/55, 1957 (15-6).*

The *shamba* system, whereby agricultural crops are grown between planted trees until tree shade prevents further successful raising of food crops, depends for its full success on adequate fencing. An experimental planting of *Cupressus lusitanica* was made in 1948 at 8 × 8 ft. spacing, on 3 adjoining areas: (1) fenced and cultivated by standard *shamba* practice; (2) and (3) land abandoned after war-time wheat growing, were unfenced and pit-planted, (2) being relatively clean and (3) covered with kikuyu and couch grass. Mean diam. in inches and height in feet in 1955 were: (1) 4.76, 28.7; (2) 2.66 and 3.34, 20.1 and 23.1; (3) 2.39, 19.4. [The two figures under (2) represent browsed and unbrowsed plants.]

3940. KHAN, S. A. *Attempt to regenerate Shisham in conjunction with cultivation of cotton in Khanewal irrigated plantation. Pakistan J. For. 7 (1), 1957 (39-43).*

Describes an experiment in which 66 acres of the regeneration area of this irrigated plantation were cleared and planted with *Dalbergia sissoo* stumps and a crop of cotton by lessees, the forest department providing irrigation. A good crop of cotton was obtained, and 85% establishment of Shisham after one growing season. Establishment costs were ca. Rs.25/acre compared with Rs.30 by ordinary methods, and there was better growth and fewer weeds.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

See also No. 3627.

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also No. 3793.

3941. BERGMAN, F. *Försök med tvångsfruktificering av tall, gran och björk. [Research on inducing fruiting of Pine, Spruce and Birch.] Svenska Skogsvärd. Tidskr. 53 (3), 1955 (275-304). 17 refs. [Sw.sw.]*

In detailed experiments on Pine, trees were subjected to single or combined treatments by strangulation or ring barking (both at different points on the stem), root pruning and application of fertilizer. Many of the treatments stimulated flowering in the first few years, although results varied from year to year. The treatment also affected the trees' vitality and cone length, seed weight, germination etc. For this reason, strangulation and ring barking in the neighbourhood of the crown should not be used, and strangulation at b.h. also seemed to lower the vitality dangerously. Application of K salts and root pruning encouraged

flowering without harming the trees or reducing seed quality. In smaller experiments on Pine and Birch, flowering was increased by strangulation at breast height. Results are given in tables and graphs.

3942. NILSSON, B. *Markbehandlings inverkan på blomsättning och fröbeskaffenhet hos ympräd av tall. [The effect of site treatment on flowering and seed production of grafted Pine.] Svenska Skogsvärd. Tidskr. 53 (3), 1955 (305-10). 3 refs. [Sw.]*

In experiments with 2-year-old grafts, begun in 1949, site treatments were (1) ploughing and harrowing, (2) piling grass turfs round the grafts in a circle 70 cm. in diameter, (3) planting on waste ground with heavy grass growth. Flowering in 1953 and 1954 was significantly higher for (1) than for (2) and (3). Cone length and 1000-seed weight were not affected by treatment, but % of empty seeds was slightly lower and amount of viable seed per cone higher, on (1). Cone material was, however, too small for definite results.

3943. KIELLANDER, C. L. *Beskärning och formning av barrträdsympar i fröplantager. [Pruning and shaping conifer grafts in seed orchards.] Svenska Skogsvärd. Tidskr. 54 (1), 1956 (75-93). 9 refs. [Sw.sw.]*

Pruning should begin in the nursery and should be done annually. It should aim at a strong main stem of upright growth, though height growth must be restrained in favour of growth in breadth. Spruce and Larch must be kept to a single stem; Pine may be allowed to develop a multiple stem. The general crown shape should be more or less pyramidal or conical, retaining branches almost to the ground. Later, dense crowns will need to be opened by removing whole branches. Any shoots from the rootstocks must be carefully removed. Most conifers are pruned in Feb. and March, but Pine can be pruned after flowering. A watch must be kept against accidental strangulation by metal fastenings of labels etc. [Cf. F.A. 13 No. 2051.]

3944. LANTELMÉ, D. W. *Die Bedeutung der Pflanzlings-Samenplantagen. [The role of grafted seed orchards.] Forst- u. Holz. 12 (7), 1957 (109-11). 1 ref. [G.g.]*

Questions the practical (as distinct from the scientific) value of such orchards, criticizing the underlying assumptions from genetical, technical, and economic standpoints. For Silver Fir and Douglas Fir, however, seed orchards of trees grown from seed are recommended.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 3965-6.

3945. KLÍR, J., KOZÁK, J., and NOVOTNÝ, M. *Technika sběru semen s vysokých stromů. [The technique of seed harvesting from tall trees.] Lesn. Práce 35 (12), 1956 (537-47). [Cz.]*

Presents the results of an investigation into the efficiency, safety, hygiene and physiology of labour, of different methods of harvesting seed from tall trees in Czechoslovakia, viz: ordinary rope ladder, lift, 'Silon' ladder, climbing irons and the use of

catapult, airgun, mountaineer's rope and paratrooper's vest. The accuracy of shooting from a bow was found to depend very much on the amount of wind, so that a catapult, and especially an airgun, are to be preferred as a means for fixing a ladder or lift on a tree. Ascent and descent with climbing irons is the quickest of all. The 'Silon' [nylon?] ladder is inferior to the ordinary rope ladder, because it stretches in use, and because the climber feels less safe on a relatively thin ladder. Results of physiological tests on lung aeration, blood pressure, pulse and breathing rate are shown in diagrams for the main climbing methods. It is concluded that the best method, from all points of view, is by climbing irons combined with a mountaineer's rope for facilitating the descent, and a paratrooper's vest instead of the conventional safety belt.

3946. HUTT, P. A. **Conifer seed collection and extraction.** *Quart. J. For.* 51 (2), 1957 (116-20 + 6 photos).

Describes methods used on the Leaton Knolls and Knockin estates, such as: the use of bow and arrow to shoot a rope over a high branch and then haul up a rope ladder; spreading a strong rope net round the crown of the tree, in which the collectors are able to cover the whole crown (details given of procedure for erecting the net); operation of the kiln and extraction of seed from the opened cones.

3947. NORDSTRÖM, L. Om eftergroning hos tallfrö. [The delayed germination of Pine seeds.] *Svenska SkogsvFören. Tidskr.* 53 (1), 1955 (89-100). 20 refs. [Sw.]

Observations in recent years show that delayed germination—occurring in the 2nd year after sowing, or later—is less frequent than found by Wibeck in experiments in 1917. Possible reasons are discussed, and experiments to test their validity are described. Two-year-old seeds were de-winged by hand and cleaned, and were then subjected, with or without previous shaking in a smooth container for 15 sec. or 1 min., to soaking and up to 10 periods of alternate freezing and thawing. Germinative capacity decreased with increasing number of periods of freezing and thawing, and decreased sharply still further among seeds that had first been shaken, although germinative capacity of seeds shaken but not frozen in ice had a still lower germinative capacity. Bruising during de-winging is considered, by its effect in reducing resistance of seeds to freezing, to account for the difference between Wibeck's result and those obtained in practice today.

3948. V., V. Maşina de descărnat seminţe BS-55. [The BS-55 seed extractor.] *Rev. Pădurilor.* 71 (7), 1956 (471-2). [Rum.]

Describes, with scale drawings and specification, a machine for extracting seed from fleshy fruits (e.g. *Cornus* spp., *Prunus* spp., *Ligustrum* spp.).

232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

3949. Ein neues forstliches Saatgutgesetz in der

Schweiz. [A new forest seed law in Switzerland.] *Öst. Vjschr. Forstw.* 98 (1), 1957 (40-5). [G.]

Reprints the German text of the Swiss law on provenance and uses of forest seeds and forest plants of 16.10.56, and the administrative ordinance of 22.10.56 on its implementation and supervision.

3950. ORR-EWING, A. L. **Better timber for B.C. depends on a good seed programme.** *B.C. Lumberm.* 41 (5), 1957 (14...22).

The 144,000 acres of plantations in British Columbia are chiefly of Douglas Fir, derived mainly from seed of uncertified origin and bought on contract. Seed is now to be registered according to the classification of the Swedish Royal Board of Private Forestry as follows: A. 1-4, special lots (from controlled crosses and from elite, plus, and orchard trees); B. 1-4, from registered plus stands with a preponderance of straight, clean-boled, slender-branched trees situated < 3000 ft. from minus stands; from other plus stands; from better trees in normal stands, collected under control; from normal stands, randomly collected; from minus stands. The vast majority of cones at present collected come from B3 and B4 stands.

232.315. Seed Storage and Treatment

See also Nos. 3797-8, 3801, 4000, 4208, 4210, 4251.

3951. ALLEN, G. S. **Storage behaviour of conifer seeds in sealed containers held at 0° F., 32° F., and room temperature.** *J. For.* 55 (4), 1957 (278-81). 5 refs.

Twenty-seven seed lots, representing 11 conifer species, were stored in sealed vials for periods of 5-7 years; in most cases 10 samples of each seed lot were stored at temperatures of 0° F., 32° F., and fluctuating room temperature. Data on the germination capacity initially and after storage and on the seed moisture content are tabulated. The best lots appeared to store equally well at the 2 controlled temperatures and no consistent advantage of the lower temperature was shown for any one species. Seed at room temperature completely lost its germination capacity.

3952. EVRARD, R. Quelques considérations sur la conservation des glands. [The storage of acorns.] *Bull. Inst. agron. Gembloux* 24 (4), 1956 (505-15). 4 refs. [F.] E.M.B.

Trials showed that acorns can be successfully stored in a cold chamber at ca. +2° C., with relative humidity kept at ca. 90%, but precautions must be taken to prevent their drying out and the moist air from stagnating. The moisture content of the acorns should remain at < 45% of the fresh weight. They should be stored in a single layer in moist sand for easy inspection. *From author's summary.*

3953. MARJAI, Z. Egyes külső tényezők hatása a nyármagra. [The influence of some external factors on Poplar seeds.] *Erdész. Kutatás., Budapest* 1955 (1), (63-81 + smries. in suppl.). 10 refs. [Hu.russ. e.g.]

A detailed investigation of the effect of heat, applied in various ways, on the germinative energy and capacity of *Populus canescens*, the viability of which is to be maintained for 2-3 weeks for supplementary sowings. Drying to 8-12% m.c. by heating to 40° C. in an open vessel, and storage in a dark cool room are recommended. A suitable drying kiln is described.

3954. MARJAI, Z. Nyármagtárolási kísérletek. [Investigations on the storage of Poplar seeds.] *Erdész. Kutatás., Budapest* 1955 (4), (111-126 + smries. in suppl.). 5 refs. [Hu.russ.e.g.]

Seed of *P. canescens* in catkins could be stored for 4-6 days if kept in the shade at 18-20° C., in an 8-cm. layer, and stirred 3 times daily. Seed is 12-2% by weight of catkins. Various methods of storing in water at 18-20° failed, but success may be possible at sub-germination temperatures if clean water can be supplied as required and at the same temperature. For these tests 40,000 seeds were germinated. *From author's summary.*

3955. MÁTYÁS, V. Nyármag minőségi vizsgálata és eltartási kísérletek. [Quality examination and storage experiments with Poplar seeds.] *Erdész. Kutatás., Budapest* 1956 (2), (109-30). [Hu.russ.e.g.]

Tests show that to keep a reserve of *P. alba* and *P. nigra* seed for one month, to cover nursery failures, it is best to dry it (2 days) to 13-14% m.c. and enclose in airtight glass vessels with a gauze cylinder of $\text{Ca}(\text{ClO}_3)_2$, storing it in a cellar. Cellar temperatures up to 15° C. did not affect germination capacity.

3956. MARCET, E. Zur Aufbewahrung von Aspensamen. [Storing Aspen seeds.] *Schweiz. Z. Forstw.* 108 (4/5), 1957 (270-3). 7 refs. [G.f.]

Seed from a 25-year-old Aspen was stored in a partial vacuum (25 mm. Hg) at 2-3° C., (1) with, and (2) without seed-coat, and tested for (a) germinative capacity and (b) ability to reach the pricking-out stage (development of primary leaf). After 2 years (a) was still 98% for (1), 79% for (2), while (b) was 79 and 60% respectively. Controls stored at room temperature had lost all viability after 6 months, though (2) kept a little better than (1). The importance of (b) as a criterion is stressed.

3957. TOMAŠEVSKI, S. Mogućnost sijnja naklijalog jelovog sjemena. [Possibility of sowing pre-germinated Silver Fir Seed.] *Šum. List* 80 (5/6), 1956 (183-5). [Croat.]

In spring 1954 a large % of Silver Fir seed in storage germinated before sowing; these germinated seeds were sown in the usual way but separately from the ungerminated ones. Although the former took longer to develop shoots, after about 1 month there was hardly any difference between the two lots. In another trial, the 1-cm.-long radicles were removed from 500 germinated seeds before sowing; after 23 days 165 seeds developed fresh radicles, cotyledons and needles but the plants appeared weaker than those from normal seed.

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 3796-8.

3958. SIMAK, M. The X-ray contrast method for seed testing. *Medd. SkogsforskInst., Stockh.* 47 (4), 1957. pp. 22 + 3 plates. 25 refs. [E.sw.] Price Kr.2.

In this method, seeds are soaked in a BaCl_2 solution before X-ray photographs are taken. The solution penetrates into dead seed or that of low vitality but not into sound seed. The photographs therefore indicate the physiological as well as the anatomical condition of the seed. Only seed which resists impregnation by BaCl_2 , or which has less than $\frac{1}{4}$ of the endosperm impregnated, can be considered viable. X-ray photographs of sound and impregnated seed are given.

3959. BÄRRING, U. Groningsprocenten hos kusttallens frö i förhållande till inlandstallens frö i Halland. [Germination % from coastal and inland Pine in Halland.] *Svenska SkogsvFören. Tidskr.* 54 (4), 1956 (423-32). 5 refs. [Sw.sw.]

Tests on seed collected in 1949 and 1953 showed no difference in germination or seed weight per hl. of cones between seed lots from different distances (1-40 km.) from the coast. The germination % after cleaning was > 90%. In 1949 the proportion of empty seeds was higher for seed-tree and shelterwood than for other systems, but the amount of material was too small for any definite conclusions.

3960. LANE, R. D. Factors affecting seed germination in Pinaceae genera. *Rep. Ntheast. For. Exp. Sta.* 1956, 1957 (22).

With Virginia Pine seed, best germination was obtained from light treatment followed by a 24-hour imbibition at 5° C. and a constant temperature of 25° during germination; poor results were obtained with germination temperatures of 20° or 30°. Light treatment in the red portion of the spectrum promoted, and infra-red treatment inhibited, germination. Field results were excellent. The same treatments helped germination of Loblolly Pine, but failed with White Pine.

232.32. Plant Rearing. Nursery Practice

See also Nos. 3904, 3917, 4007.

3961. NEMKY, E. Adatok az erdeifenyő-csemeték növekedéséhez, különös tekintettel a változó fényviszonyokra. [The growth of Scots Pine seedlings with special reference to changing light conditions.] *Erdőmérnöki Főiskola Közleményei, Sopron* 1955 (55-97). 75 refs. [Hu.hu.russ.g.]

A detailed investigation of the growth of seedlings emphasizing the great advantages of full sunlight and the harmful effects of weeds, soil heating, and high concentrations of fertilizers. The morphology of the root and shoot, anatomy, dry-substance production, and duration of growth effects of first-year conditions are covered. Transplanting is especially unfavourable to growth.

3962. PAPP, L. Fenyőcsemetenevelés sovány laza homoktalajon, különös tekintettel az aljtrágyázásra. [Raising of coniferous seedlings on poor loose sandy soils, with special reference to deep manuring.] *Erdész. Kutatás., Budapest* 1956 (2), (39-59). [Hu.russ.e.g.]

Local recommendations for Austrian and Scots Pine are: sow early in March; water to meet minimum requirements and, if water suffices for this, do not shade; until the first needles appear (at 3–5 cm. height) water requirements are high. Conserve moisture by choice of soil, cultivation, straw mulching or (best) a 2-cm. layer of organic manure at 30 cm. Seedlings close-set in the drills produce better root systems. Densities at the end of the first autumn should be 80/m. for Austrian and 90–100 for Scots Pine. Undercutting seedlings in the second spring or thinning out will obviate transplanting. *From author's summary.*

3963. PAPP, L. Kiültetésre alkalmas feketefenyőcsemeték nevelése. [Raising of Austrian Pine seedlings suitable for planting.] *Erdész. Kutatás., Budapest* 1955 (3), (53–65 + smries, in suppl.). 11 refs. [Hu.hu.russ.e.g.]

For poor dry sands, seedlings should be thinned in the drills in the 2nd year to 80 per metre: for better sands 90 can be retained. About 80% of these should make suitable field plants. For rocky barrens and other similar shallow soils, the otherwise unnecessarily expensive transplant should be used, or the seedlings should be thinned in late autumn or early spring and root-pruned at a depth of 15–20 cm. *From author's summary.*

3964. Nursery techniques for and differences between provenances of Sand Pine seedlings. *Rep. St. East. For. Exp. Sta.* 1956, 1957 (54–5).

Shading and/or fertilizing 1-year-old seedlings in the nursery greatly increased their survival after planting out in deep sands at Ocala National Forest, Central Fla. Survival of 1½- or 2-year seedlings was poor because of excessive top growth. Seedlings of the west Florida (Choctawhatchee) race did twice as well as those from Ocala, grown in the same nursery.

3965. ZMIJANAC, D. Proizvodnja plataninih sadnica. [Rearing plants of *Platanus*.] *Šum. List* 80 (1/2), 1956 (17–23). [Croat.e.]

[Cf. *F.A.* 14 No. 2162.] Describes the experience gained in sowing *Platanus* seed from March to August, in variously prepared soils in wooden boxes; also results of tests with cuttings taken from 1-, 2-, 3-year and older *Platanus* stock, and a method of transplanting seedlings during the growth period. The results of tests can be summarized as follows: (1) Seed should be harvested in dry weather from young trees, and separated from its down; very dense sowing is recommended for Yugoslavia, the best time being mid-May; after sowing, the seed should be covered with a layer of humus or powdered charcoal, 2–3 mm. thick; daily watering is required until leaves are at least 2 cm. long; the seed and very young seedlings should be shaded. (2) Plants can be easily grown from cuttings taken from 2-year-old stock; the soil in which the cuttings, and later the plants, are reared should be kept moist until the end of August.

3966. KNEŽEVIĆ, I. Neka zapažanja o uzgoju sadnica platana. [Some remarks on the raising of

Platanus growing stock.] *Šum. List* 80 (1/2), 1956 (28–30). [Croat.]

The author found that, for seed of the highest germinative capacity, collection should be made from middle-aged stems and from the crown top at the end of February (Yugoslavia). The importance of conserving moisture, e.g. by scattering broken bricks, potsherds, straw etc. over the seedbed is stressed. To obtain stronger stock he recommends cutting back 1-year seedlings so as to produce the so-called 1/2 seedlings (aerial part 1 year, roots 2 years old). As regards cuttings, the author's experience is that, contrary to the literature, much better results are obtained with 1-year than with 2-year cuttings.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 3962, 3964, 3978, 4020, 4661.

3967. NOLTE, H.-W. and DIETER, A. Nematoden an Baumschulgewächsen in Mitteldeutschland. [Nematodes on nursery plants in Central Germany.] *Nematologica, Leiden* 2 (1), 1957 (63–7 + 1 plate). 7 refs. [G.g.] O.R.E.

In a nursery at Bad-Liebenwerda, parasitic nematodes (Tylenchidae and Dorylaimidae) found on badly developing plants of *Robinia pseudoacacia*, *Caragana arborescens*, *Prunus padus*, *Sambucus rubra*, *Larix*, *Pinus* and *Picea*, and others, were markedly more numerous than on thriving ones. The former also showed deformed roots. The possible role of nematodes in connexion with the phenomenon of nursery 'soil exhaustion' is discussed.

3968. HACSAYLO, E., and PALMER, J. G. Effects of several biocides on growth of seedling Pines and incidence of mycorrhizae in field plots. *Plant Dis. Reprtr.* 41 (4), 1957 (354–8). 2 refs. A.P.B.

Field plots were prepared and treated with 5 different biocides before being sown with *Pinus virginiana* or *P. caribaea*. MeBr (Dowfume MC-2) at a high concentration prevented the formation of mycorrhizae over one season and also gave increased growth of the seedlings compared with the controls, though this advantage will probably be lost later unless mycorrhizae are formed or fertilizers added. Vapam (Na N-methyldithiocarbamate) and Bedrench (allyl alcohol and ethylene dibromide) only partially prevented the formation of mycorrhizae. Ethylene dibromide and Nemagon (1,2-dibromo-3-chloropropane) had no noticeable effect on the development of mycorrhizae, but the use of the latter resulted in stunted seedlings. *From authors' summary.*

3969. SANTOS, E. K. A preliminary study on the influence of ammonium sulphate on the early development of transplant materials of Narra [*Pterocarpus indicus*]. *Philipp. J. For.* 10 (1/4), 1954 (1955), (61–79 + 1 gph., 5 photos). 7 refs.

The object of this study was to determine the amount of $(\text{NH}_4)_2\text{SO}_4$ necessary to ensure the favourable development of *P. indicus* seedlings in nursery beds in the Philippines, where the maintenance of a satisfactory fertility level often requires fertilizer applications at much higher rates than is

usual in farming practice. It was found that the optimum rate was 212.2 g./2 sq. m. or 1 ton/ha. Height growth increased with increasing dosage up to that point, beyond which applications of $(\text{NH}_4)_2\text{SO}_4$ had an adverse effect. Treated plants became a more intense green than controls. Effects were not marked until ca. 60 days after the application of the fertilizer, controls being, if anything, ahead of treated plots up to that time; 83 days after application plants in treated plots were definitely taller than controls, the difference ranging from 4.36 cm. to 20.36 cm.

3970. SWITZER, G. L., and NELSON, L. E. The effect of fertilization on seedling weight and utilization of N, P, and K by Loblolly Pine (*Pinus taeda* L.) grown in the nursery. *Proc. Soil Sci. Soc. Amer.* 20 (3), 1956 (404-8). 23 refs. O.R.E.

In factorial experiments combining various levels of N, P and K on a sandy loam, total dry weight and dry weight of surface parts during the first years were affected by N levels only; 50% or more of the nutrients were absorbed within 130 days from sowing. The rate of removal of nutrients from the soil was comparable to that by field crops.

3971. THEMLITZ, R. Der Einfluss einer Phosphatdüngung auf den Nährstoffgehalt der Nadeln bezw. Blätter verschiedener Holzpflanzen auf gleichem Standort und die Eignung des Thomasphosphates zur Manganversorgung von Nadelholzsämlingen. [The effect of phosphate fertilizers on the nutrient content of foliage of woody species on the same site and the suitability of basic slag as a source of Mn for conifer seedlings.] *Phosphorsäure, Essen* 16 (1/2), 1956 (92-103). 21 refs. [G.]

A review of published results, chiefly German, and a brief account of the author's laboratory experiments, showing: (a) that basic slag, Rhenania phosphate and crude hyperphosphate had similar effects on growth and nutrient content of foliage of Spruce and Pine seedlings on acid soils, the first being also a good source of Mn; and (b) that the uptake of labelled P_2O_5 by Pine seedlings from Rhenania phosphate fertilizer, was greater than the difference in P_2O_5 content between fertilized seedlings and controls, indicating that the fertilizer was a preferred source of the nutrient. In this last experiment, uptake during the first 60 days corresponded well with height growth. A rapid increase thereafter coincided with the formation of terminal buds, which showed a high concentration of P_2O_5 .

3972. PAPP, L. Aljrágyázás csemetekertekben. [Deep manuring in the nursery.] *Erdész. Kutatás., Budapest* 1955 (1), (49-62 + smries. in suppl.). 7 refs. [Hu.russ.e.g.]

In dry sands where Scots and Austrian Pine must be raised without irrigation or shade, beds were sown with: (a) no manure, (b) a 2-cm. layer of organic manure at 30 cm., (c) a 1-cm. layer of organic manure at both 30 and 40 cm., (d) organic manure hoed into the top 20 cm. Surface rooting and mass mortality resulted from (d); (b) and (c) gave equally good survival with better warmth and water retention at the manure layers. Microclimatic

data and seedling photographs illustrate the results. From author's summary.

3973. BOLLEN, W. B., and LU, K. C. Effect of Douglas Fir sawdust mulches and incorporations on soil microbial activities and plant growth. *Proc. Soil Sci. Soc. Amer.* 21 (1), 1957 (35-4). 13 refs. O.R.E.

Gives data on the decomposition rate, measured by CO_2 production in soil respiration tests, and other chemical data, including C/N ratios, for various organic materials used as mulches and fertilizers, relative figures for decomposition in one test being: wheatstraw 48, sawdust of Red Alder 40, of Ponderosa Pine, and Western Red Cedar 33, of Douglas Fir 30 and of Western Hemlock 27, Douglas Fir resin 30, and Douglas Fir bark, 26. Added N hastened decomposition of substances with a high C/N ratio, though it generally depressed cumulative evolution of CO_2 .

Owing to its low content in both N and available C, resulting in slow decomposition, Douglas Fir sawdust had a less depressive effect on plant growth through induced N deficiency than was commonly found in substances with high C/N ratios. At 10 tons/acre, it significantly increased first crop yields, though at 100 tons (a 5-in. layer) it depressed them. Ponderosa Pine sawdust and Douglas Fir bark at 10 tons/acre depressed yields, but added N produced increases over untreated crops in all cases.

232.323. Sowing and Covering

See also Nos. 3962, 3965-6.

3974. PARTOS, G. Feher- és szürkenyár-cseméték magról nevelése. [Raising White and Grey Poplar seedlings.] *Erdész. Kutatás., Budapest* 1955 (2), (155-63 + smries. in suppl.). [Hu.russ.e.g.]

To allow for culling, 0.5-0.7 g. (1.0-1.5 c.c.) of seed should be sown per running metre, to yield 30 seedlings with a collar diameter of 4 mm. Natural suppression of the rest occurs early. If density is $> 70/\text{m.}$, artificial thinning (to 20-25 stems/m.) appears necessary only if particularly strong plants are required; it should be done when dominants are 25-35 cm. high.

3975. MUTIBARIĆ, J. Jesenja setva šumskog semena. [The autumn sowing of tree [*Tilia* spp. and *Acer* spp.] seed.] *Šumarstvo* 9 (10), 1956 (645-6). [Serb.]

Freshly gathered seed of *Tilia tomentosa* and *T. argentea* was sown on 5 dates between 20 Aug. and 17 Sept. in Vojvodina. All the seed sown on 20 Aug. germinated by the following spring; germination of seed sown on 17 Sept. was ca. 20% less. Height growth was less for the seedlings sown in August but the difference was not considered significant. Seed of *Acer campestre* and *A. tataricum* sown in September/October after being kept one week in water, also germinated successfully.

3976. PAPP, L. Nehezen csirázó magvak kísérleti vitési. [Sowing of slow-germinating seeds.] *Erdész. Kutatás., Budapest* 1956 (1), (81-107). 11 refs. [Hu.russ.e.g.]

Seed of 32 woody species stored under various conditions has been sown since 1952 at 10-day

intervals from ripening for as long as soil conditions permit. Results are given for 10 species (*Fraxinus excelsior*, *Acer platanoides*, *A. pseudoplatanus*, *A. campestre*, *Celtis australis*, *Elaeagnus angustifolia*, *Prunus spinosa*, *Cornus sanguinea*, *Euonymus europaeus*, and *Rhamnus cathartica*).

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 3962-3.

3977. PICARD, M. Désherbage des semis de conifères et des cultures de glaieuls. [Weed control in conifer seedbeds and gladiolus beds.] *Défense des Végétaux*, Paris 11 (60/61), 1956/1957 (62-3). [F.] O.R.E.

Recommends pre-emergence treatment (10 days after sowing) of conifer seedbeds with NH_4 dinitrophenate or NH_4 dinitrocresolate at 10 kg./ha. in 1000 or 2000 litres of water. NaClO_3 and CMU are not recommended.

3978. TEÄR, J. Om kemisk ogräsbekämpning i skogsplantaskolor: behandling av besädd mark efter sädd men före uppkomst av plantorna. [Chemical weed control in forest nurseries: treatment of seedbeds after sowing but before the appearance of seedlings.] *Skogen* 44 (11), 1957 (392, 395). [Sw.]

Further tests were made, based on the results of earlier experiments [see F.A. 18 No. 1530]. Of the chemicals tested, the dinitrobutyl phenol alkanolamine salt (a) alone or with other chemicals, was the most effective, leaving 25-34% weeds, compared with the control plots. Allyl alcohol (b), and H_2SO_4 (c) each reduced the weeds to about $\frac{1}{3}$, but white spirit (d) and MCPA (e) were both less effective. Tabulated results of the effects on individual weed species show that (d) was effective against *Stellaria media*, *Chenopodium album* and *Rumex acetosella*; (a) controlled all weeds present except *Equisetum arvense* and *Agropyron repens*, and gave 50% control of *Poa annua*; (e) was only effective against a few species; (b), (c) and (e) all caused considerable loss of Pine and Spruce seedlings, but (a) and (d) had no significant effect. Treatment with (a) should be carried out not later than 1 week after sowing, at a rate of 6 litres/ha. Research on (a) and on 2,2-dichloropropionic acid will be continued.

3979. IWAMURA, M. [Applications of herbicide for forestry.] *Scientific Reports of the Saikyo University (Agriculture)*, Kyoto No. 7, 1955 (73-6). 8 refs. [Jap.e.]

The effect of Nitro herbicide (chief constituents $\text{NH}_2\text{SO}_4\text{ONH}_4$ and $\text{NH}(\text{SO}_2\text{ONH}_4)_2$) on pot germination of *Pinus thunbergii*, *Amorpha fruticosa*, *Rumex longifolius* and *Erigeron bonariensis* was tested for applications of (a) 30, (b) 60, and (c) 120 g./3-306 sq. m., with periods of up to 3 weeks elapsing between application and sowing. Each sample consisted of 25 or 32 seeds. Generally speaking, germination of all species decreased with increasing rate of application but other results were inconclusive.

232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

See also No. 3962-3.

3980. PARTOS, G. A tölgycsemte legkedvezőbb gyökérlávágási módja. [The best method of root-pruning Oak seedlings.] *Erdész. Kutatás*, Budapest 1955 (1), (107-10 + smries. in suppl.). [Hu.russ.e.g.]

Roots of young seedlings should be undercut about the end of May at a depth of 8-12 cm.; 1- to 2-year plants between mid-February and mid-April at 12-16 cm. for the first and 16-20 cm. for the second time. Root pruning is advisable also for 1 + 0 planting stock. A U-shaped knife attached to a plough or, for fewer plants, a spade, are suitable tools.

232.327. Protection Measures in Nurseries

See also Nos. 3964, 4208-15, 4294, 4351, 4362.

3981. Shade is beneficial to Engelmann Spruce initial seedling survival. *Rep. Intermt. For. Range Exp. Sta. 1956* [1957] (6-7).

A study of 1-year seedlings showed that heat girdling caused by high soil-surface temperatures was responsible for $\frac{1}{4}$ to $\frac{3}{4}$ of total mortality. Heat girdling was appreciably reduced by using lath shades, providing ca. 50% shade, in July and August. Shading had no noticeable effect on drought losses, and differences in moisture in the top 3 in. of soil on shaded and unshaded seedbeds were insignificant because of frequent and well distributed summer rains. Mortality from soil movement caused by heavy summer rains was next in importance. Weeding had no significant effect on survival.

232.328. Vegetative Propagation

See also Nos. 3650, 3718-20, 3725, 3777, 3965-6, 4203.

3982. SINGH, S. M., ROGERS, W. S., and SLATER, C. H. W. Mist propagation frames for leafy cuttings. *Rep. E. Malling Res. Sta. 1955/56*, 1957 (54-9 + 1 photo). 3 refs.

The development and installation of hydrostatically controlled mist propagation frames for use out of doors are described. Partial shading greatly aids rooting. Equal parts of coarse sand and peat form a suitable medium for propagation under mist. Rooted cuttings must be gradually hardened off before transference to the nursery. *From authors' summary.*

3983. BREVIGLIERI, N., and COSTA, L. La propagazione per talea con la 'nebulizzazione'. [The propagation of cuttings under mist.] *Ital. agric.* 94 (1), 1957 (21-39). 36 refs. [It.] E.M.B.

Briefly reviews American literature on the subject and describes the authors' experiments in propagating cuttings of a number of trees and shrubs in vermiculite under continuous mist.

3984. YOKOYAMA, M., and MAEDA, C. [Studies on the propagation of Sugi elite tree. I.] *J. Jap. For. Soc.* 38 (8), 1956 (301-5). 12 refs. [Jap.jap.e.]

The following results were obtained: (1) cuttings

that had failed to root during the first year rooted fairly well in the second year. (2) A higher % of successful grafts was obtained on rootstocks from cuttings than on seedling stocks (20 and 7.3% respectively). (3) The % of successful grafts on plants kept under vinyl film and in the open were 55 and 4% respectively. *From authors' summary.*

3985. NEGISI, K., and SATOO, T. [Photosynthesis, respiration and consumption of reserves of Sugi (*Cryptomeria japonica*) cuttings.] *J. Jap. For. Soc.* 38 (2), 1956 (63-70). 8 refs. [Jap.e.e.]

Starch content of cuttings planted on 15 April decreased by half by mid-May, and content of reducing sugar increased slightly during this period, after which levels of both remained fairly constant. On 30 June, no difference was observed between carbohydrate reserves of rooted and unrooted cuttings. Curves for the rate of photosynthesis at different light intensities were similar for seedlings and for cuttings. Daily measurements were made of the rate of photosynthesis and respiration during the 6 hours after exposure to light. For the first few days after the cuttings were planted, and again when rooting began (70 days and more later), photosynthesis was high at first but fell steeply during the next 6 hours. In the period between planting and rooting, and again after the roots had developed, the rate of photosynthesis was lower and remained fairly steady throughout the 6-hour period. These results are similar to those for *Pinus densiflora* and *Lithocarpus edulis*. Curves for respiration followed the same pattern. *From authors' summary.*

3986. QUINTIN, S. Quelques considérations sur le bouturage de *Taiwania cryptomerioides*. [Propagation of *T. cryptomerioides* by cuttings.] *Trav. Lab. for. Toulouse* 1 (5) Art. 28, 1956. pp. 6. 7 refs. [F.]

A small-scale experiment with cuttings from 1-year shoots, given various treatments and planted either in the open or in the greenhouse, showed that satisfactory results could be obtained by treatment with aqueous solutions (100 mg./litre) of β -indoleacetic acid and subsequent raising in a greenhouse with air temperature 15° C., earth temperature 24°, and r.h. 75-90%.

3987. COGGESHALL, R. The propagation of Asiatic Maples. *Amer. Nurserym.* 105 (9), 1957 (9-10, 96-9).

Softwood cuttings were taken at different times during the growing season from *Acer barbinerve*, *A. buergerianum*, *A. capilles*, *A. carpinifolium*, *A. cissifolium*, *A. tataricum*, *A. tegmentosum*, *A. triflorum* and *A. tschonoskii*, from trees between 19 and 39 years old. Cuttings were also taken, for 3 species, from 2- to 3-year seedlings in a greenhouse. The cuttings, 2-4 in. long, were treated with root-inducing chemicals before being placed in coarse sand under a wire-frame cover of polyethylene plastic. The cuttings were flooded with water and the plastic cover closed by moistening the overlapping sheets. On exceptionally hot days shading was required. Rooting took 4-12 weeks. Rooted cuttings were potted and covered with a plastic cover which was gradually removed. In the autumn they

were put in sawdust in a cold frame and planted out in the spring. Rooting was better where the cuttings were wounded before treatment with Hormodin No. 3. When the cuttings were taken early in the season they rooted very quickly and began to grow in the same season. Cuttings from seedlings rooted better than those from older plants, and grew 4-15 in. in the same season. Wherever possible, cuttings should be taken from young plants.

3988. YE, P. C. [Methods of propagating [Chinese] Poplars.] *For. Sci., Peking* 1 (1), 1955 (37-46). [Chin.]

Includes a list of Chinese Poplars with short notes on their distribution and salient growth characteristics, and some account of small-scale hybridizing experiments, producing over the period 1946-49 the numbers of seedlings noted in brackets against each cross: *P. hopeiensis* × *P. tremula* var. *dauidiana* (380), × *P. tomentosa* (77), × *P. adenopoda* (21); *P. hopeiensis* var. *villosa* × *P. tremula* var. *dauidiana* (17), × *P. tomentosa* (2), × *P. adenopoda* (350). Cuttings of many species proved difficult to root, even in spring. Bud grafts of *P. tomentosa*, made in August and September, were very successful.

3989. ALLEN, R. A., and McCOMB, A. L. Über Faktoren, die die Bewurzelung der Stecklinge von der *Populus deltoides* Bartr. beeinflussen. [Factors affecting the rooting of *P. deltoides* cuttings.] *Zbl. ges. Forstw.* 74 (4), 1955 (199-220). 88 refs. [G.g.] Also in a shortened English version, as *Occ. Pap. Sth. For. Exp. Sta.* No. 151, 1956, pp. 10. 7 refs.

In cuttings taken from 1- to 4-year-old shoots of 4-year-old wildlings from Iowa bottomlands, rooting ability and survival decreased with increased age of shoot, especially for shoots of the same diameter. Diameter had no influence on the rooting or survival of 1-year-old cuttings, though height growth was slightly better for the thicker cuttings. When the length left above ground was kept equal, the longest cuttings did best in all respects. Both indoleacetic acid (1) and indole-*n*-butyric acid (2) improved rooting and survival of November cuttings, (2) increasing significantly the number of roots formed. No effect was found on March cuttings, which all did well, including controls. A comparison of 5 moisture conditions in pot experiments with a loam and a sandy loam showed that, unless the moisture was above field capacity, rooting was not sufficient for good survival. Best results were obtained on permanently saturated soil, though cuttings showed signs of yellowing leaves and diminishing height growth at time of lifting, 47 days after setting, owing to poor aeration.

3990. ROHMEDER, E. Das Problem der Alterung langfristig vegetativ vermehrter Pappelklone. [The problem of 'ageing' of long-term vegetatively propagated Poplar clones.] *Forstwiss. Cbl.* 75 (9/10), 1956 (380-407). 43 refs. [G.g.]

Reviews previous literature on this subject and presents observations on the following: (1) Sudden death of two × *Populus serotina* clones in a flood-plain forest at the confluence of the Danube and the Isar—These clones, which had been progressively

propagated for 200–250 years, were growing on separate sites among other species and hybrids that remained healthy. (2) The growth of cuttings and grafts taken from trees of varying age and from different parts of the tree—Cuttings from the crown of 85-year-old *P. canescens* would not root satisfactorily, whereas suckers rooted satisfactorily with the aid of growth substances. Experiments with Spruce at Grafrath demonstrated the superiority of scions from young trees for grafting. (3) The venation of leaves of 'old' clones of $\times P. serotina$ and $\times P. marilandica$ was denser than in young plants and 'young' clones. (4) Assimilation and respiration of Poplar leaves of two different clones—Preliminary experiments showed that assimilation in the 'young' clone was relatively intense and comparatively less material was used in the process of respiration, whereas in the 'old' clone, assimilation was less with relatively intense respiration.

The results indicate that the clones undergo certain physiological changes as they 'age' whereby they become predisposed to disease, and that it is advisable to take cuttings and scions from young growth.

3991. SCHRÖCK, O. Das physiologische Alter und seine Bedeutung für die Wuchsleistung und Abgrenzung von Pappelklone. [The importance of physiological age for the growth potential and identification of Poplar clones.] *Wissenschaftliche Abhandlungen, Deutsche Akademie der Landwirtschaftswissenschaften, Berlin* No. 16 (Beiträge zur Pappelforschung No. 1), 1956 (39–50). 14 refs. [G.g.]

It is suggested that if points of origin were plotted against growth of cuttings, the graph would reflect the growth potential of the tree at the ages when these points were reached. It is stressed that the observations relate only to shoots from dormant buds. The author believes that some clones now distinguished by growth potential and anthocyanin content may represent merely different physiological ages of the same clone, and recommends that cuttings for propagation from mature Poplars should always be taken as near as possible to the stem base. When epicormics of similar size taken from various heights up to 16.5 m. from a tree of $\times Populus berolinensis$ [age and total height not given] were used for cuttings, only those from the first 12.5 m. rooted. All cuttings developed juvenile leaf forms. Rooting capacity and the anthocyanin content of petioles and shoots in one-year-old plants, decreased with increasing distance (*d*) of the epicormic from the stem base. Height growth increased markedly with (*d*) up to 4.5–5.5 m., and then gradually declined. Cuttings taken from shoots of the original cuttings and cuttings originating from various parts of the stem of 4 other [unidentified] Poplars showed the same tendencies, and a similar connexion between rooting ability and distance from the stem base was found in root cuttings and suckers of *P. tremula* by Lehnert in an as yet unpublished experiment.

3992. OGASAWARA, K. [Studies on cuttings of forest trees. (I). The relationship between the rooting

behaviour and the region of the tree from which cuttings were collected.] *J. Jap. For. Soc.* 38 (8), 1956 (297–300). 8 refs. [Jap.jap.e.]

In studies with *Populus nigra* var. *italica*, using the water culture method, roots generally formed before callus. No clear relationship was found between the part of the tree from which cuttings were taken and their rooting behaviour, but cuttings from the top of a branch and the lower part of the crown tended to show better rooting ability. Rooting appeared to be more influenced by the time of collection than by the part of the tree from which the cutting came. *From author's summary.*

3993. PAGONY, H. A nyárdugvánok álgeszte-sedése [I], II. [The development of false heart in Poplar cuttings. I & II.] *Erdőmérnöki Főiskola Közleményei, Sopron* 1955 (11–29); 1956 (1), (97–125). 19 refs. [Hu.hu.russ.g.]

Cuttings of 4 Black Poplar hybrids were grown for 3 years under 10 treatments, some being lifted each year for examination. Treatments were: thin (8–13 mm. diameter) and thick (14–20 mm.) cuttings, and various methods of preparation (oblique and horizontal cuts; above or below, near or further from the node; waxing the cut; and splitting the bark). The thicker cuttings showed slightly better height growth, but the thinner had less false heart and their cut ends healed faster. Waxing the ends depressed growth and increased false heart. It is confirmed that the cut should be made a few mm. above the node. The % of new shoots showing false heart in years 1, 2 and 3 was 0, 6, and 11 respectively. The last % is not likely to increase much, since many unhealed cuttings developed no false heart. Cultures from false heart in cuttings yielded bacteria and *Fusarium* [unspecified], that in older stems is probably connected with rots introduced through pruning and particularly insect wounds. It cannot be referred to the origin of the tree from a cutting.

3994. HUSSAIN, S. A note on vegetative multiplication of *Casuarina cunninghamii*. *Indian For.* 83 (3), 1957 (226–7 + 4 photos).

Describes the method of propagating by 'gooties' (air layers). The operation is begun in June, and early in October the rooted layers are severed from the parent tree, planted direct in pits (1 × 1 × 1 ft.), and watered for one month.

3995. Increasing success in grafting. *Rep. Lake St. For. Exp. Sta.* 1956 [1957], (39–40).

Fresh scions of 35-year-old White Spruce and Norway Spruce were grafted on potted White, Norway, and Black Spruce seedlings. A portion of the stocks had been exposed to various combinations of temperature and length of day. After the grafts were made, plants of each group were again exposed to short-day and long-day treatments. Results after 8 months indicate that long-day treatment after grafting increased the take to 48% compared with 22% for the short-day treatment. An actively growing cambium at the time of grafting also materially increased success. Black Spruce proved unsatisfactory as a stock plant. Covering the

grafts with mounds of sphagnum or with moist sphagnum in a polyethylene bag improved the results.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also Nos. 4012, 4024, 4026.

3996. BELTRAM, V. Kalilnik za pridobivanje sadik iz občutljivega semena. [A germinating box for growing seedlings from delicate seeds.] *Gozd. Vestn.* 14 (4), 1956 (120). [Sloven.]

The bottom of a 30 × 60 cm. open wooden box extends in length for another 10 cm. outside; the whole bottom is covered with a glass plate on which a double layer of blotting paper is laid; a 5-cm. layer of humus soil with 10% of charcoal dust is spread on the blotting paper within the box, and on the projecting portion a bottle with a constricted neck and filled with water is inverted on the blotting paper.

3997. PAGACZ, E. Utilisation en caféiculture d'un nouveau type de panier en matériaux durables. [A durable transplant basket of new type for Coffee plants.] *Bull. Inform. Inst. nat. Étude agron. Congo belge* 6 (1), 1957 (1-10). [F.]

Soldered galvanized netting, 4-5 mm. square mesh (wire 1 mm. diam.), cut to 30 × 17 cm. is shaped on a form into an open-ended cylinder, the seam being fastened by a threaded wire or by turning the wire ends. Trenches 10 times the width of, and the same depth as, the cylinder, are dug and the bottom loosened another 20 cm. and levelled. The cylinders are then set in 10 at a time and seedlings transplanted to them, the soil filling being well tamped down. To lift for field planting, the first row is freed by digging. The tap-roots of all plants are severed before lifting, and protruding side roots before field planting. Planting is done in a hole slightly larger than the cylinder, which is removed, unrolled, washed, and stored for future use. Photographs show root-growth within this basket vastly superior to that in palm-leaf and bamboo pots, which are more expensive in labour and final cost.

3998. [Raising Wattle plants in jam tins.] *Rep. Dep. For. S. Afr.* 1954/1955, 1956 (10).

Excellent results have been obtained by raising Wattle (*Acacia saligna*) plants in 1-lb. jam tins and setting them out in the field in the tins after merely cutting the bottom of the tin crosswise.

3999. GAMBI, G. Prove col '66f' nella coltura in vivaio di *Pseudotsuga douglasii*. [Tests of '66f' in growing *P. taxifolia* in the nursery.] *Monti e Boschi* 8 (3), 1957 (133-5). 4 refs. [It.]

Two-year-old transplants of *P. taxifolia* were sprayed weekly from 20 June to 15 Sept. with two different concentrations of '66f' a synthetic growth regulator (E. Gerlach, Lübeck). Figures are given for height, diameter, plant weight, and root weight at the end of the period, for both treatments and controls. Both treatments gave increased growth, the weaker (1 : 10,000) giving better results than the stronger (1 : 5000) concentration. [Cf. *F.A.* 18 Nos. 1554-5.]

4000. VOLNÁ, M., and DLOUHÝ, V. Jak zvýšíme jakost a počet sazebního materiálu pomocí humusového výluhu. [Humus extract improves the quality and increases the yield of planting stock.] *Lesn. Práce* 35 (5), 1956 (205-10). 3 refs. [Cz.]

Tests with *Alnus glutinosa* seed showed that both survival and the mean height of seedlings were highest when the seeds were treated, before sowing, with (a) IAA + nicotinic acid (1/1) or with (b) humus extract (pH 6.5), the survival figure being slightly higher for (a) and the height for (b); much poorer results were obtained when the seeds were simply steeped in water, and poorer still with untreated controls. In another series of tests, seeds of *Larix decidua* were found to give the highest survival figure, number of roots, seedling height and root length when pre-treated with (a) in a concentration of 0.1%; other concentrations, as well as mixtures with butyric acid and controls, gave poorer results. When roots of 1-year *A. glutinosa* seedlings were soaked in different stimulants for 17 hours, the tallest stems and longest roots were again found with (a) (0.01%), while (b) and water had roughly the same effect, with the controls much poorer.

4001. BÎNDIU, C., and RUBȚOV, Ș. Contribuții privind influența desimii și a stimulenților de creștere asupra dezvoltării puieților de frasin. [The influence of density of sowing and of growth substances on the development of *Fraxinus excelsior* seedlings.] *Rev. Pădurilor* 71 (6), 1956 (368-72). [Rum.]

Gives data from nursery experiments, showing the improvement in vigour, diameter and height of 1-year seedlings treated with 0.005% 2, 4-D or 0.015% α -naphthaleneacetic acid, and increase in quality of seedlings with reduced sowing density.

4002. PALMER, J. G., HACSKEYLO, E., and MAY, C. Growth of tree seedlings not stimulated by application of streptomycin to their roots. *Proc. nat. Shade Tree Conf.* 1956, [1957] (65-74). 3 refs.

Experiments were made with pot-grown seedlings of *Ulmus americana*, *Acer rubrum*, *Liquidambar styraciflua*, and *Pinus virginiana*, treated at various intervals with soil applications of different concentrations of streptomycin. There was no stimulation of growth and no apparent influence of the antibiotic on root structures (mycorrhiza, short roots etc.).

232.33. Formation of Stands by Direct Sowing

See also Nos. 3792, 3897, 4029, 4078.

4003. KRZYSZTOFIK, E. Niektóre osobliwości modrzewia polskiego. [Some peculiarities of *Larix decidua* var. *polonica*.] *Las Polski, Warszawa* 31 (2), 1957 (8-9). [Pol.]

The author found that Larch cones after extraction usually contain a fair amount of seed, and should be used for sowing. Sowing should be done in spring or summer in clearings, preferably on the S. side of old stumps. Another observation refers to the tending of the seedlings. In order to protect the young roots of self-sown seedlings from being bared or even seriously injured when the sod is torn by hoeing, he recommends removing the sod by hand

and replacing it by mineral soil; otherwise the 'tended' seedlings are likely to show a poorer growth than untended ones.

4004. DICKSON, W. A. **Experimental seeding of Black Spruce on Cormack Burn, Newfoundland. Project NF 10.** *Tech. Note For. Br. Can.* No. 49, 1956. pp. 11.

Sowing *Picea mariana* in spots was the most satisfactory method of resowing an area one year after burning. Broadcast sowing on snow gave better stocking but used very much more seed, and broadcast sowing on bare ground immediately after the snow had melted gave unsatisfactory stocking.

4005. KOLEHMAINEN, V. A. Hankikylvö. [Broadcast sowing [of Pine] on the snow crust.] *Metsät. Aikak.* 1957 (4), (116-9). [Fie.]

Experiments were begun in 1913 at Tuomarniemi and have continued ever since. Results so far are summarized. The method has been most successful after burning, on rather moist soils. As burnt areas are especially liable to dry out, moisture conditions in the spring are very important. The success of the sowing cannot be assessed before about 5 years. The seed requirement is ca. 1.2-1.5 kg./ha. One man can sow 2-3 ha./8-hour working day. Mechanical sowing has generally failed. *From author's summary.*

4006. AKIMOČKIN, G. N. Opyt vyraščivaniya polezaščitnyh lesnyh polos gnezdovym sposobom. [An attempt at raising shelterbelts by the 'nest' method.] *Agrobiologija* 1956 (3), (139-41). [Russ.] I.M.I.

Nest sowings of Oak were made in the central forest-steppe region of Orlov province. Acorns were sown 6-8 cm. deep; in 1949 and 1950 respectively, 7-8 and 6-7 acorns were sown per spot, and mycorrhizal soil was added. Agricultural crops planted on the intervening strips [width not stated], were rye, oats, buckwheat and flax. Data are given on survival and height growth of seedlings in 7 plots of 0.05 ha. from 1949 to 1954. In Sept. 1954, no plot in the 1950 sowings showed > 8.7% blank 'nests', and in most cases the stocking represented 12.3-18.5 thousand plants/ha. Some data are also given on the yields of the field crops for the same period. The nests were weeded for the first 3 years, after which the seedlings formed close canopy in the nests, preventing any further growth of weeds and making weeding unnecessary.

232.4. Formation of Stands by Planting

See also №. 3904.

232.41. Planting Stock (Type, Handling and Treatment)

See also No. 4333.

4007. VIKINGE, L.-A. Några synpunkter på plantimport och plantförsörjning. [Aspects of plant imports and plant supply [in Sweden].] *Skogen* 44 (12), 1957 (418-20, 437). [Sw.]

Discusses the figures for imports (mainly of Spruce) into Sweden from Europe since 1950 and

Sweden's need for plants, describes briefly the 1400-ha. forest nursery at Halstenbek near Hamburg, and discusses the advantages (cheapness, quality and high yield) of the contract system by which 1 + 1 Pine plants are raised in Germany from Swedish seed and returned to Sweden, with notes on the transport and packing methods used.

4008. SAMUSE, F. F. Prirodnye pitomniki topolja na Altai. [Natural Poplar nurseries in the Altai.] *Priroda, Moskva* 46 (2), 1957 (86-9). [Russ.] A.P.B.

Describes the natural growth and reproduction of *Populus laurifolia*, *P. nigra* and *P. alba* on the flood-plain of the river Ulba in Kazakhstan, pointing out the value as a source of Poplar and Willow wildings of the innumerable seedlings that colonize sandbanks etc., only to be swept away in flood-time. It is cheap to lift selected seedlings either in summer, to be grown on in the nursery, or in autumn, for planting out. In this work, a watch should be kept for promising natural hybrids.

4009. SANDVIK, M. Problemer ved lagring og transport av granplanter. [Problems in storing and transporting Spruce plants.] *Norsk Skogbr.* 3 (6), 1957 (161-5). 4 refs. [Nor.e.]

Results of experiments in 1954-55, on lifting 2 + 2 plants at different dates in the spring, confirm that, except in cool seasons with temperatures < 10° C., plants should be lifted as soon as possible after the ground has thawed, and stored in a refrigerator room before planting out, not lifted and planted out immediately. With 2 + 0 plants, mortality during the succeeding 2 years was very high (ca. 80%) among those plants lifted, sorted, and transplanted the same day in early or mid-June, and low (5% or less) among those lifted on 15 May and kept in a refrigerator room 2-4 weeks before transplanting. The following recommendations for autumn lifting and heeling in at the planting site are made as a result of experiments: (1) For higher and more northerly parts of Østland, plants should be sent out late in September and for areas further south or lower, 2-4 weeks later. (2) The heeling-in site should be open but not too exposed, and well drained. (3) Plants should be set upright and 4-year plants not closer than 100-150 plants per metre of trench. (4) Planting out should be done as soon as the soil has thawed.

4010. BJÖRKMÄN, E. Om lagring av tall- och granplanter. [Storing Pine and Spruce plants.] *Norrländs SkogsvFörb. Tidskr.* 1956 (4), (465-83). 9 refs. [Sw.e.]

Experiments were made in storing 2 + 0 Pine and 2 + 2 Spruce plants in controlled temperatures during winter for 5½ to 8 months and in spring for 1-2 months. Drying out could be prevented almost entirely by storage in sealed plastic bags, but not by covering with paper. Best results were obtained in winter storage at 0° C.; with storage at 2-3° moulds jeopardized survival. At -3° up to 91% of the plants survived planting after storage in plastic bags for 5½ months, but only 27% after storage for 8 months. Mortality was higher for temperatures of -10 to -20°. For the shorter periods of spring

storage excellent results were obtained at -3° . Chemical treatment, especially with PCP preparations, gave satisfactory results with plants stored in plastic bags or in wooden boxes with damp moss round the roots at $2-3^{\circ}$ for 2 months. The $2+2$ Spruce survived better than $2+0$ Pine. Any extreme change of temperature on removal from the refrigerator room increased mortality; an intermediate 'thawing' period had little effect except with considerable temperature differences, e.g. from -3 to $+20^{\circ}$. Investigations are continuing.

4011. SOEST, J. VAN. Verdrogingsverende maatregelen en middelen bij uitplanten van Douglas. [Methods of reducing mortality of Douglas Fir during planting out.] *Uitvoer. Versl. Bosbouwproefsta. T.N.O., Wageningen* 3 (1), 1957. pp. 14 + 4 tbls. 10 refs. [D.u.e.]

Three medium-sized experiments were set up in 1954-55, using 3- to 4-year nursery stock, with a number of treatments and combinations of treatments, and heeling-in periods of different lengths. The main treatments were: coating the above-ground parts with Good-rite Latex VL 600; packing the whole plants or the roots in polythene bags; and covering the plants with polythene after planting. None of the methods appreciably reduced mortality, although, in dry weather, storing the plants packed in polythene in a cool place may give better results than planting out into dry soil. Mortality increased with the length of the heeling-in period. The value to the forester of having his own small nursery, enabling him to plant out in suitable weather and to avoid long heeling-in periods, is emphasized.

4012. PUDDEN, H. H. C. Nursery work and planting. *Rep. For. Dep. Kenya* 1954/55, 1957 (15).

Comparison of plants raised in wooden trays (the standard practice) and longer-rooted plants grown in lines, showed no difference for *Pinus radiata* but better survival of tray plants for *P. patula*. Transport of naked-rooted plants in crates met with success in an initial trial; plants raised in lines suffer a longer period between lifting and planting than do plants raised in boxes, and crating may be a practical method of conserving moisture during this period. Deep planting was tried with overgrown plants (up to $5\frac{1}{2}$ ft. high) of *P. radiata*, *P. halepensis* and *P. patula*, as much as 6 in. of stem being put below the surface. The first two species were successfully planted in this way, but the largest plants of *P. patula* died. Plants in trays sunk into the ground showed 40% more height growth than plants in trays placed on the ground, and the superiority appeared to be maintained on planting out.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 4012, 4023, 4101.

4013. [Size of planting holes for *Eucalyptus rostrata*.] *Rep. For. Res. Nigeria* 1954/55, 1957 (11).

Comparison of large (2 ft. wide and 2 ft. deep) and small (1 ft. wide and 1 ft. deep) planting holes, both spaced 6×6 ft., showed that plants continued to grow in the larger after growth had ceased in the

smaller holes. Addition of superphosphate in the planting hole is being compared with use of compost, which encourages rapid root development but at the same time encourages termites. There was no significant difference between the two treatments at the end of the first growing season.

4014. PFORT, E. Ergebnisse einiger Düngungs- und Startversuche zu Pappel, Roteiche und Douglasie. [Some fertilizer and starting trials on Poplar, Red Oak and Douglas Fir.] *Forst- u. Holzw.* 12 (7), 1957 (111-4). [G.]

Poplars planted on former poor pasture in the Rhine floodplain, when given 0.5 to 0.7 kg. of Wichtel fertilizer, a peat preparation, mixed in with the planting-hole soil, grew better and were more resistant to disease and pests than untreated or limed plants on the same site. Treatment 3 years after planting also gave good results, as did planting-hole treatment of Red Oak, and the addition of a few handfuls of very wet peat to the planting-hole soil of Douglas Fir, particularly if moderately enriched with liquid farmyard manure.

4015. KALBHENN. Der Einsatz einer Klein-Pflanzmaschine auf Vollumbruchflächen. [The use of a small planting machine on completely ploughed land.] *Forst- u. Holzw.* 12 (11), 1957 (181). [G.]

Describes the German 'Accord' planting machine designed for vegetable crops. A pair of these machines, drawn by a 10-h.p. two-wheeled tractor, have been used successfully for the afforestation of waste land on light and medium soils. A team of 1 driver and 3 women planted 30-40 thousand one- to two-year-old conifers in an 8-hour day, but there was need for a follow-up column to reset some plants and fill gaps. Each machine costs DM.258.

232.43. Spacing and Arrangement in Plantations

See also Nos. 3809, 4056.

4016. VANSELOW, K. Einfluss des Pflanzenverbandes auf die Entwicklung reiner Fichtenbestände. III. [The influence of spacing on the development of pure Spruce stands. III.] *Forstwiss. Cbl.* 75 (7/8), 1956 (193-207). 3 refs. [G.]

A further report on the Wessling stands [cf. F.A. 13 Nos. 2089-90], an experiment still of theoretical interest, although the establishment of pure, even-aged Spruce stands is not now considered advisable. Data are presented on the stocking of the stands in 1954, height increment, changes in height class, crown development, d.b.h., basal area, stem form, thinnings, volume increment and natural pruning.

4017. GUILKEY, P. C., and WESTING, A. H. Effects of initial spacing on the development of young Jack Pine in northern lower Michigan. *Pap. Mich. Acad. Sci.* No. 41, 1955 (1956), (45-50). 2 refs. L.S.

Spacing experiments were made, planting $\frac{2}{5}$ -acre plots with Jack Pine at intervals of $1\frac{1}{2} \times 1\frac{1}{2}$, 3×3 , 5×5 , 7×7 and 9×9 ft. Each of the 5 spacings was replicated 5 times. A table shows the average height and d.b.h. after 10 and 15 years. After 15 years, diameter growth was suppressed in the first two spacings; a preliminary thinning will be necessary in the 5×5 ft. spacing before a commercial thinning is

practicable. A stand density of 7×7 ft. is regarded as the most satisfactory. Trees spaced 9×9 ft. apart are too heavy limbed to yield good sawtimber.

233. Afforestation

See also Nos. 3670, 3760, 3775, 3778, 4203, 4217, 4844.

4018. HANSEN, N. J., and McCOMB, A. L. Growth, form and survival of plantation-grown broad-leaf and coniferous trees in southeastern Iowa. *Proc. Iowa Acad. Sci.* 62, 1955 (109-24). L.S.

Presents data, collected in 1952 and 1953, on 12- to 15-year-old plantations of 17 hardwood and 10 coniferous species growing on old fields and degraded forest land. The hardwoods developed well on uneroded, uncultivated sites, chiefly round old farmsteads, but on eroded former cultivation the conifers showed much better growth. Among the hardwoods Green Ash survived well and had a high volume increment, and Cottonwood and Silver Maple also grew rapidly. Black Locust arrested gully erosion but many of the trees were destroyed by insects before reaching merchantable size. Of the conifers, Jack and Virginia Pine grew satisfactorily on all upland sites, particularly on well drained soils. Mortality was high for Red and White Pine but, on cool moist sites permitting deep rooting, their growth is expected eventually to exceed that of other northern Pines. Damage by animals was sometimes severe, the most important pests being field mice, gophers, deer and rabbits. There was some insect damage, mainly by *Megacyllene robiniae*, and an unidentified sawfly that defoliated Red Pine and Jack Pine. Fungal injury was not significant.

4019. MAISENHOLDER, L. C., and HEAVRIN, C. A. Silvics and silviculture of the pioneer hardwoods—Cottonwood and Willow. *Proc. Soc. Amer. For.* 1956, 1957 (73-5).

Describes the silvicultural characters of *Populus deltoides* and *Salix nigra*, which are pioneer species on the 'new land' of the Mississippi meanders, and makes recommendations for planting these species on such sites.

4020. GÜNTHER, H. Untersuchungen über die Verwendung von Pappelstecklingen zur Kippenkultivierung in der Niederlausitz. [The use of Poplar cuttings for the revegetation of spoil mounds in the Niederlausitz.] *Wissenschaftliche Abhandlungen, Deutsche Akademie der Landwirtschaftswissenschaften, Berlin* No. 16 (Beiträge zur Pappelforschung No. 1), 1956 (51-70). 6 refs. [G.g.]

After trials with 2-year-old plants of various hardy varieties on sandy, nutrient-deficient spoil mounds had failed, chiefly because of wind damage, trials with cuttings of $\times$ *Populus berolinensis* (1), and *P. trichocarpa* (2) proved more successful; (1) rooted better than (2). Addition of lime at time of planting improved rooting and height growth. A second liming and cutting back after one year had no significant effect. Longer cuttings (up to 7 buds) did better than shorter ones. Tests were also made in the nursery with a soil amendment consisting chiefly of granulated lignite, with peat and lime

added, designed both to act as a fertilizer, and to improve soil moisture retention. When this was used, either pure or mixed with soil in proportions of 2:1 or 1:2, in planting holes for *P. robusta* cuttings, it greatly stimulated height growth, which was more than doubled in the first growing season by the heavier applications. In field trials with (1) and (2), however, the effect nowhere exceeded that of lime, and in some instances was unfavourable, possibly because of some unknown deleterious constituent of the lignite, which came from a different pit.

4021. SZÖNYI, L. A bányaműveléssel érintett területek újrahasznosítása. [Revegetation of mine spoil-mounds.] *Erdész. Kutatás., Budapest* 1956 (3), (37-67). 35 refs. [Hu.russ.e.g.]

There are some 1500 ha. of spoil-mounds in Hungary, mainly from open-cast bauxite and brown-coal mining and sandy borrow-pits. Mines can co-operate in improving these areas by working them quickly and by handing over promptly spoil heaps having good shape and soil material. The soils (analyses given), have a high Ca content and tend to dry out. Fertilizing and planting with pioneer tree species are the first tasks.

4022. HÉDER, I., and STEFANIK, L. A Hernád-völgy keleti oldalán a szilikát kőzeteken kialakult kopárok vizsgálata. [The barren lands on the east side of the Hernád valley.] *Erdész. Kutatás., Budapest* 1955 (2), (165-89 + smries. in suppl.). [Hu.russ.e.g.]

Describes in some detail the site factors of a karst area and particularly the microclimates as affected by topography and aspect. Silvicultural recommendations are tabulated under site type, aspect, and primary rock, and take into account previous history, soil deterioration, and topography. Lists are given of suitable species for planting and their proportions in mixture. Protection and soil cultivation are also covered.

4023. ZRAŽEVSKII, A. I. Estestvennoe vozniknovenie lesnoi počvy na kamenistyh rossypjakh i sposoby ih oblesenija. [Natural formation of forest soil on rock slides and ways of afforesting them.] *Počvoved.* 1956 (10), (50-7). 5 refs. [Russ.] A.P.B.

Sandstone rock slides in the central Carpathians often have 'perched' soils of the brown-earth type, consisting only of a humus horizon varying from 8-10 to 25-35 cm. in depth, and lying directly on and between the stones. In undisturbed conditions they may carry high-quality Spruce/Fir stands. On bare rock slides the formation of forest soils and colonization by tree vegetation is preceded by a moss and lichen stage. N content is very high in the lichen stage, and increases as tree cover is established. Most of the soil N occurs in the form of protein. Recommendations for the afforestation of eroded rock slides based on experiences in the Transcarpathian and Stanislav provinces in 1955, include making planting holes lined with stones, 40×40 cm. or 40×70 cm. and 8-10 cm. deep, for individual or group plantings. In group plantings of 4-5 seedlings, 600-800 spots/ha. are sufficient. Before planting in spring, the holes are filled to a depth of 8-10 cm. with fine earth brought, where necessary, from a near-by forest. The soil should be used while

fresh to preserve its flora and fauna intact. Plantings of Spruce and Silver Fir showed 90–100% survival. Measures should be taken on perched soils to prevent erosion and on slopes with a southerly aspect all except sanitation felling should be prohibited.

4024. Atti del Convegno per l'Alberatura da Legno nella Bonifica del Mezzogiorno. [Proceedings of the conference on plantations for wood production in land reclamation schemes in the south of Italy.] Ente Nazionale per la Cellulosa e per la Carta, Rome, 1956, pp. 182 + map. [It.]

Includes the following papers: The influence of plantations on the climate of reclamation areas in S. Italy (*A. de Philippis*); The soils of Central Italy in relation to tree planting (*V. Morani*); Some specimen plantations and the lessons to be learned from them (*A. Pavari*); Phytopathological aspects of shelterbelts (*C. Sibilia*); Shelterbelts and bee-keeping (*R. Sacchi*); The 'Fitocella', a new type of plant container of plastic material (*R. Piccione*).

4025. SINGH, B. Ravines and afforestation in old Madhya Bharat state. *Indian For.* 83 (4), 1957 (273–8 + 2 photos).

Reviews work already done and future proposals for dealing with severe gulley erosion.

4026. PRAKASH, M., and PATHAK, S. 'Brick planting' in shifting sands of West Rajasthan. *Indian For.* 83 (3), 1957 (224–5 + 1 photo).

[Cf. *F.A.* 13 No. 2109.] Species recommended for planting out in shifting sands in 'earth bricks' are (a) *Tamarix articulata* (branch cuttings); (b) *Prosopis juliflora* (shoot cuttings); (c) *P. juliflora*, *P. spicigera*, *Tecoma undulata*, *Cordia rothii*, *C. myxa*, *Zizyphus* spp., *Salvadora persica* (sowings); and (d) *Eucalyptus rostrata* and all species in (c) except *Prosopis* spp. (young transplants).

4027. MUHAMMAD, S. Soil moisture with special reference to the afforestation of dry areas and management of existing forests. *Indian For.* 83 (4), 1957 (265–72). 36 refs.

A general discussion, emphasizing the importance of determining soil-moisture conditions and if possible improving them, before undertaking afforestation of arid areas.

4028. FRANZINI, F. Les boisements artificiels dans les savanes de la région de Pointe Noire. [Afforestation of savannas in the Pointe Noire region of French Equatorial Africa.] *Bois For. Trop.* No. 53, 1957 (25–32). [F.e.span.]

Large areas of unproductive savanna are to be planted with pulpwood species, and experiments are in progress with *Eucalyptus saligna*, *E. rostrata* and several other Eucalypts, as well as *Casuarina equisetifolia*. Some notes are given on planting methods and results obtained.

4029. DUBOIS, J. Semis forestiers sur buttes incinérées. Leur importance dans les travaux de reforestation des savanes du Bas-Congo. [Direct sowings on burned mounds in reforesting savannas of the Lower Congo.] *Bull. Inform. Inst. nat. Étude agron. Congo belge* 6 (1), 1957 (21–30). [F.]

A preliminary report on direct sowing on 'mafuku', burned heaps of grass covered with earth before burning. The following species were tried on degraded calcareous soils in poor savanna: *Eucalyptus citriodora*, *E. robusta*, *Grevillea robusta*, *Lannea weltwitschii*, *Mangifera indica* and others. Best results were obtained with *E. citriodora* (mean height after one year, 78 cm.) and *E. robusta* (mean height after one year, 149 cm.). Growth was better than that obtained with transplants, and labour requirements in man-days/ha. for the first year were 171 compared with 510 and 681 for balled and basket planting stock respectively.

4030. GROULEZ, J. Le reboisement des savanes pauvres de la ceinture brazzavilloise. [Reforestation of poor savanna land in the Brazzaville belt.] *Bois For. Trop.* No. 50, 1956 (9–15). [F.]

Discusses measures for reforestation now being practised. Experience has shown that local species have the best chance of survival, the main one for regeneration being *Milletia laurentii*, with *Hymenocardia acida* as a nurse crop.

4031. LOPEZ, M., and CUNANAN, C. Brief history of the Canlaon reforestation project. *Philipp. J. For.* 10 (1/4), 1954 (1955), (15–31 + map). 4 refs.

An account of plantations made between 1938 and 1941, and more or less abandoned during the war. When re-examined in 1946, Mahogany (7% survival) was much superior to any other species. Some account is also given of the afforestation programme carried out since the war.

234. Formation of Forest by Natural Succession

4032. BABOS, I. A nyárfások homokbuckán előforduló megjelenési formái. [Forms of Juniper/Poplar stands growing on sand hills.] *Erdész. Kutatás., Budapest* 1955 (4), (31–86 + smries. in suppl.). 22 refs. [Hu.russ.e.g.]

The author divides the wooded dunes between the Danube and the Tisza into 5 groups based on topography, soil moisture, drainage etc., illustrated by many photographs and by transect diagrams, cutting across form-line maps or plans. The most important group silviculturally consists of bare ridges separated by short valleys ca. 10 m. deep, from which closed stands of White and Grey Poplar and Common Juniper are spreading. Indicator plants, variant types, vegetation catenas and the first desiderata in silviculture are discussed.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 4030, 4056, 4063, 4077, 4079–80, 4173, 4453.

4033. BAUMGARTNER, A. Über die Unterschiede in den klimatischen Wuchsbedingungen einer freien und einer birkenüberstellten Wiederaufforstungsfläche. [The difference in climatic growth conditions between a clear and a Birch-covered site undergoing afforestation.] *Forstwiss. Cbl.* 75 (7/8), 1956 (223–39). 5 refs. [G.]

A study was designed to elucidate the factors favouring the development of a main crop of Spruce,

Silver Fir, Larch and Oak, (a) under Birch of the same age (the nurses at 5 years being ca. 5 m. high and about to close canopy), compared with (b) a Spruce plantation of the same age, without a nurse crop. The following comparisons were made: *Air and soil temperatures*: In (a) at crown and stem levels average temperatures throughout the day were higher than in (b), but temperatures at and near the soil surface were lower. At night the reverse was true. Fluctuations in temperature throughout the day at a height of 1 m. were greater in (a), but at, and in the region of, the soil surface extremes of temperature and fluctuations throughout the day were greater in (b). *Wind velocity*: At a height of 70 cm. above the ground, wind velocity in (b) was comparable to that at lower levels in (a). In consequence there was probably a higher concentration of CO₂ available for assimilation within the stand in (a). *Relative air humidity*: No difference was found. *Transpiration over the growing period*: Transpiration in (b) was $\frac{1}{3}$ more at a height of 200 cm. and $\frac{1}{2}$ more at a height of 70 cm. than in (a). *Precipitation and dew*: No advantage could be seen in (a) in the way of accumulation of reserves. Moisture that might have been available from reduced transpiration of the main crop and from the absence of other water-using ground cover was taken up by the Birch, which also served to intercept some of the precipitation and dew.

It is concluded that the small differences in temperature and moisture conditions cannot explain the differences in growth. The possible effect of greater air stability on CO₂ concentration merits further investigation. While the beneficial effects of a shelterwood in protecting seedlings from frost and reducing soil erosion are acknowledged, it is thought that the observed better growth under shelter must be attributed chiefly to non-meteorological factors.

4034. LINDER, A. Günstige Auswirkung des Birschirmes auf das Wachstum gleichzeitig eingebrachter Kulturen. [Favourable nursing effect of Birch sown at the same time as the main species.] *Forstwiss. Cbl.* 75 (7/8), 1956 (239-42). 5 refs. [G.]

Discusses possible reasons for such effects as found in afforestation trials in the Thiergarten forest district. They do not seem to be due directly to a more favourable microclimate [cf. preceding abstract], but rather to a complex of effects ascribed to the more natural, mixed and storeyed structure of the stands.

4035. MIEGROET, M. VAN. Untersuchungen über den Einfluss der waldbaulichen Behandlung und der Umweltfaktoren auf den Aufbau und die morphologischen Eigenschaften von Eschendickungen im schweizerischen Mittelland. [The effect of silvicultural treatment and environmental factors on the structure and morphological characters of Ash thickets in the Swiss Mittelland.] *Mitt. Schweiz. Anst. forstl. Versuchsw.* 32 (6), 1956 (229-370). 48 refs. [G.f.e.it.]

A monograph based on numerous sample plots on good sites at medium altitudes in the cantons of Zurich, Thurgau and Zug, carrying 6- to 13-year-old Ash. General site conditions, soils, plant-sociological position, and relation to neighbouring stands are

described. Four groups of treatment are distinguished: (a) neither fenced nor tended; (b) tended but not fenced; (c) tended and fenced; (e) cut back, tended, and fenced. Density, age distribution, structure, growth, morphology (of stem, crown and branching) and quality (stem form, injuries) are analysed in relation to treatment, site factors (including overhead and side shade), manner of establishment (fast or slow natural regeneration) and extent and composition of admixtures (Sycamore Maple, Alder and Oak being the most important). On (a) the original number of stems was very high. Fencing affected quality rather than quantity. No connexion was found between density and height growth. Sycamore Maple tended to outgrow Ash in stem-by-stem mixtures. Relative growth of Oak and Ash was variable; in general a mixture of Oak was not unfavourable. A proportion of 50 to 75% Ash was generally found to be the most favourable, producing the highest proportion of Ash in the dominant layer. Fencing and tending increased, while side shade and admixtures decreased height and, even more, diameter growth. Cutting back favourably affected height growth and quality. Both the quality of the thickets as a whole and the number of sound dominants of good form tended to decrease with age. No passage of trees from the middle storey to the dominant storey was observed, even in well tended stands, social position being determined early, particularly in thickets that have been cut back. Recommendations for treatment are given, stressing the need to regulate mixtures at an early stage and practice early positive selection.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also No. 4003.

4036. KUSTER, J. Windwände zum Schutze von Aufforstungen. [Wind screens for the protection of young plantations [in the high Alps].] *Schweiz. Z. Forstw.* 108 (4/5), 1957 (284-5). [G.]

Emphasizes the dangers to young trees from excessive depth and long duration of snow cover, difficulties sometimes increased by protective works against avalanches. Discusses, with illustrations, the beneficial effect of boards, ca. 3 m. high, 3 m. wide at the top and 2 at the base, placed at right angles to the slope. These cause crater-like formations in the snow, and the ground becomes snow-free much earlier. They are also useful as a protection against avalanches.

4037. Enumeration of seedlings and saplings carried out in Sapoba Forest Reserve. *Rep. For. Res. Nigeria* 1955/56, 1957 (8-9).

A comparison was made of methods of making seedling counts: (a) Malayan milliacre system, (b) Ghana quadrat system, and (c) the Nigerian system of making a count on a fairly large plot in the middle of the sample plot. The results show that: (1) in the thicket conditions existing in Nigerian high forest where the canopy has been opened, no total seedling count including the smallest class of seedlings can be accurate; (2) methods (a) and (b) give figures for seedlings ≥ 3 ft. high which are comparable (98 and 85/acre) and probably not very

inaccurate considering the many difficulties; (c) gave extremely conservative results (44/acre) and can only be taken as a very general and conservative indication of what regeneration is being produced. The great difficulty of obtaining an accurate seedling count in these tangled thickets makes comparison of seedling enumeration methods also very difficult.

237. Amelioration of Forest Sites

See also Nos. 3651, 3937, 4020, 4029, 4340, 4366, 4368.

4038. VAHTERA, E. Metsänkasvatusta varten ojitettujen soitten ravinnepitoisuuksista. [The nutrient content of bogs drained for afforestation.] *Commun. Inst. for. Fenn.* 45 (4), 1956. pp. 108. 98 refs. [F.g.g.]

Samples from bogs of various types and drained in varying degree, from many parts of Finland, were analysed for their plant residues, composition of surface layers of peat, pH, ash content and contents of N, Ca, Mg, P and K. Changes caused by drainage and by the volume of wood growing on the bog are discussed. A classification based on mineral content and pH is compared with the existing Finnish classification for drainage suitability. [Cf. *F.A.* 17 No. 738.]

4039. BØRJESON, P. Studier över skogsproduktionen å några avdikade torvmarker, belägna inom Västerbottens kustland. [Studies of increment on drained peatlands, situated mostly in the coast districts of Västerbotten.] *Norrlands SkogsvFörb. Tidskr.* 1957 (1), (1-94). [Sw.g.]

[Cf. *F.A.* 9 No. 1850.] Reports on the third remeasurement in 1955 of the 15 sample plots, including brief notes on the state of the sites before draining, thinnings carried out, and the state of the stands in 1935 and 1945. On all the plots, originally unproductive and carrying few trees, site class has improved, sometimes to class II, and all are covered with young, well grown trees. In the period 1946-55, c.a.i. had increased on all but 2 plots, with a mean of 6.4 cu.m./ha. compared with 4.7 in 1936-45. This figure, like that for volume per ha., is above the mean for the Västerbotten coastal districts. Annotated data are given for the 3 species, Scots Pine, Norway Spruce and Birch.

4040. GOOR, C. P. VAN. Standort und Düngung von japanischer Lärche (*Larix leptolepis*) in den Niederlanden. [Site factors and the use of fertilizers with *L. leptolepis* in the Netherlands.] *Phosphorsäure, Essen* 16 (1/2), 1956 (81-91). 10 refs. [G.g.]

In addition to pot experiments previously described [cf. *F.A.* 15 No. 1084] the paper discusses investigations on the nutrient status and site class of 200 trial plots aged 20 years or more, on sandy soils with total P_2O_5 contents of 15-25 mg./100 g. and a N% of 1.50-1.75 in the humus layer, except where fertilizing and/or agricultural use had changed the picture. Leaving aside plots with $P_2O_5 > 75$ mg./100 g., a high positive correlation was found between site quality and P status on moist and on dry sites, but not on intermediate ones. On the moist and dry sites there was also a clear relationship between site

quality and pH (taken as an indicator of available N) with an optimum at 4-4.5, and a superiority of the moist sites. Recommendations for fertilizing with P_2O_5 , based on these findings, are given.

4041. LEIBUNDGUT, H., and RICHARD, F. Beitrag zum Problem der Düngung im schweizerischen Waldbau. [The use of fertilizers in Swiss silviculture.] *Schweiz. Z. Forstw.* 108 (3), 1957 (129-44 + 1 plate). 21 refs. [G.f.]

Reviews Swiss and foreign literature, chiefly in relation to different soils, and reports on experiments with first-generation Spruce aged 45-70 years on a rich brown forest soil near Zurich, comparing 6 treatments—basic slag, $Ca(NO_3)_2$, $Ca(OH)_2$, K salts, full fertilizing, and none, given thrice in 7 years. No significant differences in diameter growth were found. The authors believe that under Swiss conditions, where nutrient-deficient soils are rare, silvicultural and physical amelioration will more often be indicated than chemical.

4042. ATTENBERGER, J. Düngerwirkung an Fichten auf Hochmoor. 1. Wirkung der Düngung mit Kalk, Kali, und Phosphorsäure auf den Höhenwuchs der Fichten. [Effect of CaO , K, and P_2O_5 on the height growth of Spruce.] *Phosphorsäure, Essen* 16 (1/2), 1956 (44-55 + 1 plate). [G.g.]

Describes trials started in 1943 and 1944 on a drained raised bog, alt. 600 m., near Penzberg, Upper Bavaria. Four- to five-year-old Spruce, most of them root-pruned, were planted, either after complete cultivation or on ridges, and given basic slag, K salts, and $CaCO_3$, either singly or in combination, at time of planting, at dosages equivalent to 60 kg. P_2O_5 , 60 kg. K_2O , and 500 or 1000 kg. CaO /ha. Some plots received a second application of 90 kg./ha. P_2O_5 in 1950. Measurements in 1951 on once-treated plots showed a clear height superiority of P and K plots; the effect of CaO was not statistically significant, and had disappeared by 1954. In both 1951 and 1954, the combination $CaPK$ was clearly best, but the effect of K had decreased at the later date, while P plots increased their superiority. On all plots that had not received P originally, the 1950 application clearly stimulated height growth, while on the others the effect was not significant. Differences in planting methods were not significant, but root-pruning had a marked and lasting effect on height growth.

4043. OKSBJERG, E. Om rødgranens næringsoptagelse på fattig jord. [Uptake of nutrients from poor soil by Norway Spruce.] *Repr. from Hedeselsk. Tidsskr.* 77 (6; 15; 16), 1956; 78 (1; 2), 1957. pp. 44. 65 refs. [Dan.e.]

Consists of the following sections: (1) Plan and preliminary results of the new fertilizer trials by the Hedeselskab in Spruce plantations at Haraldslund and Flensborg, with discussion of earlier research by the author at Gludsted. (2) A review of recent literature on tree nutrition. (3) Discussion of results of the trials described in (1). (4) Comments on lay-out, plot size and fertilizer application for future trials. The main conclusion drawn from the 3 Danish heathland experiments is that the addition of N causes significantly increased leader growth and

needle size, but P, K and Ca have no significant effect. At Gludsted, where fertilizers containing trace elements were used, some of the Mn supplied has been taken up by the trees, but without effect on growth. No relationship between trace-element deficiency and *Fomes annosus* attack could be proved; contents of these elements in the humus layer did not vary between diseased and healthy parts of a stand.

4044. HAUSSER, K. Ertragssteigerung in der Forstwirtschaft durch mineralische Düngung. [Increased yields in forestry from inorganic fertilizers.] *Phosphorsäure, Essen* 16 (1/2), 1956 (9-27 + 2 plates). 21 refs. [G.g.]

A review from the literature (mostly German) of the effects of commercial fertilizers on the yield of Spruce and Pine, with a comparison of application costs to probable increases in financial returns and recommendations for research and practice.

4045. WEHRMANN, J. Die Nährelementversorgung der Dauerlupine auf Sandböden der Oberpfalz. [Fertilizer treatment of perennial lupin on sandy soils in the Upper Palatinate.] *Forstwiss. Cbl.* 75 (9/10), 1956 (357-66). 17 refs. [G.g.]

There are areas on poor soils in the Upper Palatinate where both Pine and perennial lupin (the latter established as a soil improver) make only moderate growth. Experiments to improve the growth of the lupin by means of fertilizers are described. Response to lime, H_2PO_4 , K and Mg was good, though unbalanced or excessive fertilization can have harmful effects.

4046. Growth of Corsican Pine on sand dunes. *Rep. Macaulay Inst. Soil Res.* 1955/56, [1956] (42).

Response of young Corsican Pine on Culbin Sands during the year 1955-56 to P fertilizers applied in 1954 was very small. There was no increase in the rate of height growth, and the increase in Ca content of the needles, observed in the 1st and 2nd growing seasons after application, was not maintained. It is concluded that P is not a primary limiting factor to tree growth on dunes as it is on many upland heath and peat soils. Since earlier work has shown that it is the K and Mg contents of the needles that are most affected by seasonal fluctuations in soil moisture, and since the foliage N content of trees at Culbin is considerably lower than that of Corsican Pine growing on more normal soils in the same area, the fertilizer trials have been extended to test the effect of these 3 elements on tree growth. Colour differences were clearly discernible in the foliage at the end of the first growing season after application.

4047. Tree growth on deep peat. *Rep. Macaulay Inst. Soil Res.* 1955/56, [1956] (42).

Work at Lon Mor on the physical and chemical changes taking place in deep peat as a result of afforestation has been concentrated during the year on a plot of *Pinus contorta* planted in 1928, part of which was treated with ground mineral phosphate in 1939. Analysis of samples from depths down to 10 in. show that nutrient concentrations in the peat are lowest under the treated trees, which are clearly

showing more vigorous growth. The greatest reduction, compared with unplanted peat, is in total K and inorganic P, but total Ca and N show similar trends. Intermediate values are given by the upper layers of the peat under untreated trees; at greater depths the amounts are not appreciably different from those in the unplanted ground. The moisture content of the peat under treated trees is lower than that in adjacent unplanted ground and where peat is < 18 in. deep, the drying effect of the trees appears to be irreversible, resulting in considerable shrinkage of the peat and the formation of deep vertical cracks. On these shallower peats, the roots of the more vigorous trees have reached the underlying moraine.

4048. WESTON, G. C. Fertilizer trials in unthrifty pine plantations at Riverhead Forest. *N.Z. J. For.* 7 (3), 1956 (35-46). 7 refs.

Forest establishment was begun in 1926 on hilly, scrub-covered country that had once carried Kauri forest. The soils are largely infertile, poor-structured clays, deeply weathered and partly eroded. Symptoms of ill-health have since occurred in a significant % of the plantations. Good responses to heavy dressings of phosphate have recently been obtained in the older unthrifty areas of *Pinus radiata*, which show some similarities to disordered stands in Australia, but Zn has not yet been effective. Other elements are being tried experimentally, and the results of more economical dressings of superphosphate, applied in small trials and also from aircraft on a semi-practical scale, are awaited. *Author's summary.*

4049. DILLER, J. D., WHITTAKER, C. W., and ANDERSON, M. S. Long-term response of old Japanese Chestnut trees to fertiliser. *J. For.* 55 (4), 1957 (299-300). 1 ref.

In 1944 and 1945 fertilizer was applied to 50-year-old Japanese Chestnut at Fairfax, Va. After 2 years no effect on d.b.h. was observed [cf. *F.A.* 8 No. 2103]. In 1955 d.b.h. was re-measured. An analysis of the variance of d.b.h. increments for the 10-year period was significant at the 5% level between the trees that received P and K and those that received none. The difference remained significant at the 5% level when the 10-year d.b.h. increment was subjected to co-variance analysis with relation to tree d.b.h. in 1944. The difference between N application and no N, however, was not significant. Data are tabulated.

4050. DUCHAUFOUR, P. Note sur l'amélioration des humus bruts en vue du reboisement à l'aide de résineux. [The activation of raw humus with a view to afforestation with conifers.] *Rev. for. franç.* 9 (5), 1957 (380-4). 25 refs. [F.]

Briefly reviews the literature and gives conclusions reached from experimental work carried out at the Experiment Station at Nancy, on the afforestation of heathland with a deep layer of raw humus. A clear distinction must be made between (a) very acid (pH 3.5-4) humus poor in bases, occurring on poor gravels and sands, and (b) humus rich in bases though in difficultly assimilable form, and only slightly acid (pH 4.5-5), occurring in brown podzols

on schists, crystalline rocks etc. Whereas (a) are improved by liming, (b) may be actually rendered less suitable for conifers. The treatment suggested is thorough ploughing with a disc plough, so as to mix the organic and mineral horizons but not to bury the raw humus, and to follow this, for (a) by a moderate application of lime and if possible a NPK fertilizer worked into the soil, and for (b) a small quantity of N and P (a suggested formula is 1 ton basic slag + 200 kg. cyanamide per ha). Once the conifers are established, the sowing of lupins is recommended.

4051. DUCHAUFOR, P., and MANGENOT, F. Recherches sur l'évolution expérimentale de certains humus. [Experiments in the improvement of certain types of humus.] *Annales Agronomiques, Paris (n.s.)* 7 (2), 1956 (159-81). 20 refs. [F.g.e.russ.] E.M.B.

Specimens of raw humus from Scots Pine litter and of highly acid peat were subjected to the following treatments after incubation in plastic containers under near-optimum conditions of moisture and aeration: (1) mechanical sieving, (2) addition of $(\text{NH}_4)_2\text{SO}_4$, (3) addition of CaCO_3 , and (4) addition of both $(\text{NH}_4)_2\text{SO}_4$ and CaCO_3 . The NH_4 - and NO_3 -N were determined twice weekly. At the end of 1 month and 4 months, all samples were subjected to biochemical and microbiological analysis. The fungus flora was incapable of fixing NH_4 -N in organic form in a highly acid medium, and failed to synthesize humic acids. The mineralization of organic N was slight. Neutralization of the medium by CaCO_3 , however, led to the proliferation of bacteria and actinomycetes which fixed NH_4 -N in an organic form, giving a substantial production of humic acids. There was a simultaneous sharp decrease in the C/N ratio. Consequently liming combined with mechanical treatment should transform raw humus or peat into biologically active humus of the 'mull' type. [Cf. F.A. 17, No. 48.] From authors' summary.

4052. WITTICH, W. 50 Jahre Ebnath. (Weitere Untersuchungen über die Melioration extrem ungünstiger Rohhumusböden). [Fifty years at Ebnath. (Further investigations on the improvement of extremely unfavourable raw-humus soils).] *Forstwiss. Cbl.* 75 (9/10), 1956 (407-22). 18 refs. [G.g.]

Reviews briefly the main events of this 50-year-old experiment [cf. F.A. 4 pp. 214-5], and presents the results of some further analyses devised to judge the duration of the effects and the degree of improvement in the soils after 50 years. The results demonstrate the suitability of the measures taken to counteract N and Ca deficiency. Even the oldest of the stands are now of good quality class.

4053. COSACK, J. Utilisation des ordures ménagères et de la gadoue dans la silviculture: expériences faites en Allemagne et aux Pays-Bas. [Utilization of household refuse and sewage in forestry: German and Dutch experiments.] *Schweizerische Zeitschrift für Hydrologie, Basel* 17 (2), 1955 (501-13). [F.] L.S.

Describes beneficial effects on both soil and tree growth of applying (a) fresh, roughly screened, town refuse in layers of ca. 30 cm., covered with 10-15 cm. of sand, on sandy sites near Arnhem, (b) roughly

screened, decomposed material from old garbage dumps near Eindhoven and (c) specially prepared compost, in the afforestation in the 1930's of the Dutch heaths near Grollo and Schornlo. The author further describes experiments in progress with (a) on marshy land (not yet evaluated) and with (b) on inland dunes near Zons and Dormagen (Rhine valley near Düsseldorf), where various amounts up to 75 tons/ha. were applied before and/or after strip cultivation. Results of the first growing season in survival and growth were highly satisfactory for all species tried, Scots Pine, Larch and Douglas Fir responding well to increased dosages, though not Beech and Alder. Analysis of (b) showed a high pH, a Ca content of ca. 5%, organic matter ca. 7% and a C/N ratio of 4:1. Where lignite is used extensively as a domestic fuel, B content is a potential limiting factor for the utilization of such refuse.

4054. RUDOLPH, V. J. Further observations on irrigating trees with cannery waste water. *Quart. Bull. Mich. agric. Exp. Sta.* 39 (3), 1957 (416-23). 1 ref.

Measurements were made of 3-year plantations of *Acer negundo*, *Populus deltoides*, *Salix nigra* and *P. balsamifera* irrigated during each growing season with cannery waste water, high in organic matter [cf. F.A. 16 No. 4073]. Survival and growth were considerably higher on the irrigated land than on the control plot for all species except *P. deltoides*. *S. nigra* did best, averaging 9 ft. in height as compared to 1½ ft. on the control area. The organic matter content of the top 3 in. of soil has doubled as a result of 3 years spraying with the waste water; pH also increased. The waste water has also affected soil properties at a depth of 3-6 ins. but to a lesser extent. Study of tree growth and soil properties will be continued.

4055. CSAPODY, S. A Jenőmajori szikkisérleti telep novenycönológiai kiértékelése. [The plant-sociological method of evaluation at the Szik-soil research station, Jenőmajor.] *Erdőmérnöki Főiskola Közleményei, Sopron* 1955 (157-72). 7 refs. [Hu.russ. g.]

A summary of observations made by the station (established 1937) on the improvement of szik soils by planting with various species and mixtures (Tamarisk, *Elaeagnus* sp., *Populus robusta*, Robinia, Oak, Ash, Elm, etc.), based on a study of plant sociology and soil. Association tables and biological and floristic spectra illustrate the rate, extent, and nature of the improvement.

238. Timber Plantation Crops requiring Special Treatment

See also No. 3871.

4056. MILOVANOVIĆ, M. Neka zapažanja i podaci v mladim topolovim kulturama. [Observations and data on young Poplar plantations.] *Šumarstvo* 9 (1/2), 1956 (15-26). [Serb.e.f.]

Between 1948 and 1953 six plantations of × *Populus robusta*, pure and in mixture, were made at Pančevo. Rows were spaced 3-6 m. apart. Five sample plots of 1.6-4 ha. were established, and

data are given on the thinnings made, number of stems/ha., mean d.b.h., height, and annual increment. Poplars grown for pulp or matches on a 10- to 15-year rotation should, the author considers, be grown in pure stands and at a greater density. On longer rotations with less dense stands, an auxiliary species should be introduced. Of the 3 species tried, *Fraxinus americana*, *Acer negundo* and *Ulmus effusa*, none was suitable as they are liable to outgrow and suppress the Poplar; *A. negundo* is, moreover, frequently attacked by *Hyphantria cunea*.

24. Tending of Stands and Trees

241. Cleaning

See Nos. 4035, 4113.

242. Thinning

See also Nos. 4056, 4433.

4057. **Thinning research.** *Rep. Dep. For. S. Afr. 1954/1955*, 1956 (17).

When the Correlated Curve Trend (C.C.T.) projects were laid out in the main coniferous species nearly 20 years ago, it was decided, in view of the extreme range of densities of stocking represented, not to rely upon alignment charts for obtaining stem volumes of sample trees, but to measure a number of trees on each project. This entailed climbing 3520 trees every second year, which as the trees became older and taller and the dead branches more decayed, became more and more arduous and dangerous. Experiments with various optical instruments failed to provide an acceptable solution at a reasonable cost. A cheap and effective answer to the problem has now been found. A test conducted with all the *Pinus patula* trees so far measured in C.C.T. plots of extreme and intermediate densities of stocking shows that the actual measured volumes compare equally well with the volumes derived from the *P. patula* alignment chart in all cases, indicating that extreme variations in form resulting from different densities of stocking are closely related to difference in the d.b.h./height relationship. Some improvements are to be made to the chart, and further climbing should be unnecessary for this species. Alignment charts for other species are to be tested in the same way.

Owing to the rapid growth of *Eucalyptus saligna* in C.C.T. plots, the rate at which successive spacings begin to show suppression is unusually rapid; 1200 stem/acre begin to show suppression at 1 year 11 months, compared with 3 years for *P. patula*, while plots thinned in advance of suppression had already to be reduced to 400/acre by this age (a stage reached by *P. palustris* only at 9 years).

4058. SOPP, L. A kísérleti állományápolások módszere és gyakorlati tanulságai. [Methods and practical results of stand tending experiments.] *Erdész. Kutatás*, Budapest 1955 (2), (121-54 + smries. in suppl.). 15 refs. [Hu.russ.e.g.]

Argues, quoting data, that final crop trees should be permanently marked at thinning, and fast-growing species at cleaning or even partly at establishment. Maximum diameter increment should be the primary aim. Enough second-storey stems should be

retained, or the stand underplanted if soil water suffices. A graphic record showing intermediate yields and growing stock against age should be used. This will also indicate unthrifty stands in need of conversion or replanting. A comparison of Hungarian and foreign yield tables shows the neglect of thinnings in Hungary, with consequent loss in quality and quantity of final crop. Many more sample plots are required.

4059. SOMKUTI, E. Az erdeifenyő növekedésének és fejlődésének néhány sajátossága az ápoló-vágásokkal kapcsolatban. [Some characteristics of the growth and development of Scots Pine as indicators of stand tending.] *Erdész. Kutatás*, Budapest 1956 (3), (3-36). 28 refs. [Hu.russ.e.g.]

On good sites in the Moscow region, stems classified by Nesterov's system [cf. *F.A.* 18 No. 775] were examined for height, diameter and volume increment, wood anatomy at various ages, and external characteristics. Recommendations for thinning Scots Pine are: Remove early developers (*b*) to favour late developers (*a*). From crown-closure to year 30, such thinnings should be heavier than usual and pruning resorted to if necessary; then, to year 50, thinnings should be lighter than usual, ensuring a crown ratio of $\geq 33\%$ at the end of this period, the main object being the prevention of heavy seeding. From year 50, thinnings should get progressively heavier, still removing (*b*) class stems first, which will considerably increase the increment of the (*a*) stems. This system will divert the nutrient supplies away from the production of large seed crops, heavy branches and surplus needles and bark, and will raise quantity and quality increment besides producing early a desirable assortment of timber from (*b*) stems. The residual crop is also of higher disease resistance, and better timber quality than if composed of fast-growing individuals.

4060. SKILLING, D. D. Twelve-year results of a mechanical thinning in over-dense Jack Pine. *Tech. Note Lake St. For. Exp. Sta.* No. 489, 1957. pp. 2.

Thinning experiments were made in 1945 near Solon Springs, Wis., in 4-year stands of *Pinus banksiana* varying from 8500 to 18,500 stems/acre and averaging 8 ft. high and 0.6 in. diam. Thinnings were made with a heavy 6-ft. Athens disk pulled by a crawler tractor so that all cleared strips were 6 ft. wide. Three treatments were tested: (1) disking of land, and leaving untreated alternate 6-ft. strips (2) disking and leaving untreated alternate 3-ft. strips, and (3) cross-disking to leave blocks of trees 6 ft. square. Eighty milliaacre plots were established for each treatment, and average height, d.b.h. and stand density were measured after 12 years. Results are tabulated. Average d.b.h. of the largest 1000 trees/acre was 3.1 in. for (2) and 3.0 in. for (3), compared with 2.6 in an unthinned area. Almost no advantage was gained from (1).

4061. STIELL, W. M. The Rockland Red Pine plantation 1956. *Timber of Canada* 18 (4), 1957 (32-3, 56). 4 refs.

Continues the comparison (growth to 1956 after the 1952 thinning) of thinned and unthinned stands [cf. *F.A.* 14 No. 3370].

4062. WORTHINGTON, N. P. Some economic considerations in thinning Douglas Fir. *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 137, 1957. pp. 8. 1 ref.

A 25-year thinning experiment was started in 1949 in the McCleary Experimental Forest, Wash., in 45- to 55-year stands of site-class II Douglas Fir. Each year ca. 40 acres have been lightly thinned, giving a 5-year cycle over 200 acres. The production per man-day and thinning costs in the first 6 years are tabulated and a comparison is made of the advantages of thinning over not thinning, calculated on the basis of final felling at 80 years, and taking account of logging and road costs. The added net income from thinning is calculated as \$1.75/acre/year.

4063. ERTELD, W. Zur Entwicklung der Eiche auf sandüberlagerten Lehmstandorten des nord-deutschen Jungdiluviums. [The development of Oak on clay-loam soils overlaid by sand in the diluvial region of north-eastern Germany.] *Forstwiss. Cbl.* 75 (5/6), (160-81). 10 refs. [G.g.]

Presents the results of observations on a series of trial plots of 50-70 years' standing. According to the yield tables of Schwappach/Wiedemann 1920/1946 [see *F.A.* 12 No. 1634] all the plots show a progressive rise in site class between the ages of 32 and 144 years. The relationship between periodic yield and stocking of the residual stand remains the same with heavy crown thinning (c.t.) and heavy low thinning (l.t.), the periodic yield amounting to ca. 50% of the total yield estimated at the previous inventory. With moderate l.t. it amounts to only ca. 30% and with light l.t. only 20%. With a heavy l.t. or a c.t., both aiming at maintaining a b.a. of ca. 19-22 sq.m./[ha.?] total yield is the same. Moderate thinnings aiming at a high b.a. of 28-33 sq. m. give a much higher total yield. Almost as high a total yield is obtained by light l.t. aiming at a b.a. of 37-41 sq. m. Maximum increment of the stand will therefore be obtained with moderate thinning. Comparisons of financial yield show the advantage of moderate l.t.'s over the A and C grades. On the sites in question, the maintenance of Oak middle- and under-storeys is possible and these had a favourable influence in preventing the formation of epicormics on the final crop trees. Here c.t. is recommended as the most advantageous treatment. From the point of view of volume yield it is advisable to aim at maintaining a b.a. that, at the age of 100 years, will be 6-10 sq.m. higher than those laid down in the Schwappach/Wiedemann tables. In the early life of the stand very gradual removal of the poorest trees, with the gradual introduction of c.t. at 40-60 years, is preferable to the comparatively early, heavier c.t.'s recommended by Schwappach. In view of the beneficial influence of the Oak understorey, the introduction of a Beech understorey is recommended in the later life of the stand.

4064. KOLTAY, G. A nyár- és egyéb állományok ápolása. [Tending stands of Poplar and other species.] *Erdész. Kutatás., Budapest* 1955 (1), (3-16 + smries. in suppl.). [Hu.russ.e.g.]

Stands of *× Populus marilandica*, *Robinia pseudo-acacia*, *Juglans nigra*, and *Quercus robur*, variously

thinned at 15, 11, 10 and 19 years respectively and measured 4 years later, showed that total volume had increased with heaviness of thinning, except in the case of Poplar—asccribed to its having been thinned too late. A spacing experiment showed that *× P. serotina* requires 30-40 sq. m., 4 years from planting.

4065. HELLINGA, G. Organisasi jang efisien dari penundjukan pendjarangan. [Efficient organization in thinning operations.] *Rimba Indonesia* 5 (9/12) 1956 (433-49). [Jav.Du.du.e.]

Discusses thinning problems in Java and gives tabulated data showing, for *Acacia decurrens*, *Pinus merkusii*, *Agathis loranthifolia*, *Albizia falcata*, *Anthocephalus cadamba*, and *Tectona grandis*: total areas in 1953; areas planted in 1950-55; recommended thinning frequencies (*A. decurrens* 5 times in its 8-year rotation, *P. merkusii* 6 times in 30 years, *Agathis loranthifolia* 9 in 40, *Albizia falcata* 4 in 10, *Anthocephalus cadamba* 7 in 25, and *T. grandis* 14 in 80); and [plantation?] areas planned by the Forest Service in future for each species, thinning frequency, annual thinning area, etc. Discusses the establishment of a trained thinning team within the Forest Service, to undertake all the thinning of a certain species within an area of suitable size; thus at least 2 teams would be needed for *A. decurrens* in Java, 1 for *P. merkusii* and several for *T. grandis*.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also No. 3901.

4066. CLARK, F. B., and LIMING, F. G. Low-grade hardwood stands in the Missouri Ozarks respond to stand improvement. *J. For.* 55 (5), 1957 (354-8). 3 refs.

Fellings of 4 intensities were made in the Clark National Forest, in spring 1938, to determine the response of hardwood and Shortleaf Pine reproduction to release. The overstorey consisted mainly of the cull species *Quercus marilandica*, *Q. stellata* and *Carya* sp., with some *Q. velutina*, *Q. alba*, and Shortleaf Pine. The hardwood reproduction was chiefly 3- to 5-year coppice; Pine seedlings had been planted 2 years earlier. The fellings removed (a) 0, (b) $\frac{1}{3}$, (c) $\frac{2}{3}$ and (d) all of the overstorey (residual b.a. of 79, 53, 27 and 0 sq. ft./acre). Each treatment included nine $\frac{1}{10}$ -acre plots, except the control (six plots). Measurements were made after 10 years [cf. *F.A.* 8 No. 2412] and after 17 years. The understorey recruitment i.e. trees of > 1 in. d.b.h. was greatest in stands with the least overstorey. In 1954 the b.a./acre of understorey trees was: (a) 1.2, (b) 3.3, (c) 18.5 and (d) 77.8 sq. ft. The number of cull species in the understorey decreased, while Pine, Black Oak and White Oak increased. On (a) no Blackjack or Post Oaks reached 1 in. d.b.h. Pine responded best to release; on (d) in 1954, the b.a. of understorey Pine averaged 45.3 sq. ft./acre, 5 times that of the species of next highest b.a. On (c), response of Pine to release was only $\frac{1}{4}$ as great. In the overstorey the b.a. increment % was greatest for (c) and least for (a). White and Black Oaks grew better than Blackjack and Post Oak. For these and

similar stands, cull trees should be removed as soon as possible to stimulate growth of the residual trees and to encourage natural regeneration. Stand density should be > 90 sq. ft./acre for maximum b.a. growth. Complete release from overstorey competition is necessary for rapid growth of Pine; under the condition studied, Pine outgrows hardwood reproduction.

4067. JARVIS, J. M. The effectiveness of ammonium sulphamate for killing defective tolerant hardwoods. *For. Chron.* 33 (1), 1957 (51-3).

Results of tests on 143 trees (with 48 controls), mainly *Acer saccharum*, *Betula lutea* and *Fagus grandifolia*. Results were promising, and indicated that application of NH_4 sulphamate crystals in axe 'cups' is an effective way of destroying these species, especially Maple and Beech, given close cup-spacing (4-6 in. apart for small trees and 1-2 in. for large). Costs amount to ca. $5\frac{1}{2}$ cents and 20 cents each for poison for small and large trees respectively.

4068. [Experiments in poisoning weed trees.] *Rep. For. Res. Nigeria* 1955/56, 1957 (7).

Preliminary results indicate that butyl ester 2,4,5-T is effective in killing weed trees, while 2,4-D has little effect. Small trees were killed by any solution of the former in diesel oil at concentrations $> 1\%$. For larger trees a 10% solution applied to blazed bark was necessary for a kill, but trees treated with 5% solution were all affected and many are likely to die.

4069. CEBRON, P. Les essais d'empoisonnement avec phyto-hormones en forêt du Téké. Application des résultats aux travaux d'enrichissement en forêt dense. [Test of 2,4-D and 2,4,5-T for poisoning trees in Téké forest, Ivory Coast. Application of results to the improvement of dense forest.] *Bois For. Trop.* No. 52, 1957 (9-15). [F.e.span.]

Experiments were made with 5% diesel-oil solution of Débroussaillant Pechiney-Progil (250 g./litre of butyl glycol esters of 2,4-D and 2,4,5-T) applied to the bark in a band 30-40 cm. wide at man-height. Results were promising, very few species proving refractory. Data are tabulated and discussed, with some account of costs, seasons, etc. The use of the method for encouraging natural regeneration of valuable species is discussed. [Cf. *F.A.* 15 No. 1361.]

245. Tending of Trees, Pruning etc.

See also No. 4332.

4070. PUDDEN, H. H. C. Pruning [of *Cupressus lusitanica*]. *Rep. For. Dep. Kenya* 1954/55, 1957 (16-7).

An experiment in pruning 3-year-old *C. lusitanica* showed that occlusion was most rapid when pruning was done in April-June, and slowest in Feb.-March. Similar results were obtained on 5-year-old plants, but occlusion was slower than on the younger trees. Indications are that pruning as high as $\frac{3}{4}$ will cause high volume loss relative to half-height pruning. It was found that ocular estimation of half height in Cypress is usually much too low (about $\frac{1}{2}$ instead of $\frac{3}{4}$).

4071. Pruning research. *Rep. Dep. For. S. Afr.* 1954/1955, 1956 (17-8).

A dial-gauge dendrometer sufficiently sensitive to detect the growth taking place in the stem of a tree in a single hour, is being used to determine the effect of pruning live branches from *Pinus patula* trees and to trace the influence of climatic factors on radial growth. Preliminary results indicate that if not more than $\frac{1}{2}$ of the living crown is removed, the loss of increment is more or less inversely proportional to the portion of crown taken away. Thus in a period of 7 weeks after pruning, the increment of 16 trees from which $\frac{1}{3}$ of the crown had been removed was $\frac{3}{4}$ of that of unpruned controls, while in an equivalent number from which $\frac{1}{2}$ of the living crown had been removed, it was nearly $\frac{1}{2}$ of that of controls. When $\frac{3}{4}$ of the crown was removed, however, the increment dropped not to $\frac{1}{4}$, but to $\frac{1}{10}$ of that of controls. This result is probably due to the practice of expressing the fraction of the crown removed in terms of vertical lengths measured along the stem, which gives increasingly greater underestimates of the proportion of foliage actually removed. It is thought that when this possibility has been checked the last result will be found to agree with the first two in showing that there is less difference than is generally supposed between the photosynthetic efficiency of needles in the upper and in the lower crown. The mean daily d.b.h. increment attained during a 7-week period of active growth by young unpruned trees of *P. patula* standing at ca. 500/acre was 0.0044 inches per day.

4072. LEHTPERE, R. The influence of high pruning on the growth of Douglas Fir. *Forestry* 30 (1), 1957 (9-20). 5 refs.

In a heavily-thinned, 11-year *Pseudotsuga taxifolia* plantation of quality class I at Dartington, S. Devon, selected trees were pruned to half height and the average length of the live crown reduced by 32%. At the end of the first growing season after pruning a significant reduction of the girth increment at breast height in all girth classes was determined. In the second growing season this reduction was only in the lower girth classes. In the third growing season the growth of the pruned trees at breast height was a little, but not significantly, better than that of the controls. There was no significant reduction in the girth increment at 15 feet, i.e. above the removed branches, nor was the height growth affected by the pruning. It appears that the suppressed part of the live crown does not contribute to timber production. The scars of removed branches heal sooner on the faster-growing trees. *From author's summary.*

4073. FOX, H. W. Bud-pruning Red Pine and Eastern White Pine in northern Illinois. *J. For.* 55 (5), 1957 (359-63). 7 refs.

In the Sinnissippi Forest, Ill., 34 trees each of 10-year *Pinus strobus* and *P. resinosa* were bud-pruned in 1947 during the dormant season, and bud-pruning was repeated annually till the trees were 17 ft. high. An equal number of trees were left unpruned. Bud-pruning consisted in removing by hand the lateral buds from the leader; the terminal

bud and 2-3 branch whorls on the basal 18 in. of the bole were left. After 6 years the mean height of unpruned *P. resinosa* was significantly greater than that of pruned trees. The difference in height of pruned and unpruned *P. strobus* was not significant. The mean d.b.h. of unpruned trees of both species significantly exceeded that of pruned trees, but the latter had higher form quotients. Data on height, d.b.h., length of needles, form quotients and average time required for pruning for the years 1947 to 1953 are tabulated.

4074. LE SUEUR, A. D. C. *Arboriculture, past and present*. *Quart. J. For.* 51 (2), 1957 (128-32 + 3 photos).

Describes some methods employed in modern 'tree surgery'.

4075. SPLETTSTÖSSER. Ästen von Eichen mit Wuchsstoffen. [Pruning of Oak with growth regulators.] *Forst- u. Holzw.* 12 (8), 1957 (127-30). 7 refs. [G.g.]

When 120 selected stems in a 50-year stand were sprayed with 2,4,5-T preparation (Tormona, manufactured by Cela, Ingleheim) in May 1953 [to what height, not stated, presumably 6 m., *vide infra*], the leaves on any branches and the numerous epicormics withered almost immediately and dropped in July. The branches and epicormics themselves showed signs of dying in the autumn, and ca. 3 years later, most of them had dropped. A few new epicormics had, however, developed. A young Beech understorey suffered little. Further experiments showed that a concentration of 0.2% of 'Tormona 80' just sufficed. For treatment to be effective, trees should be at least 30 years old, have a coarsened outer bark, and preferably be about 12 m. in height so as to stand a cleaning up to 6 m. without injury or loss of increment. It is most important that all leaves up to that height should be thoroughly wetted, for which ca. 1 litre of liquid per tree is required. Two men, using knapsack sprayers with elongated pipes, should take 20 hours to treat 200 selected stems/ha. Motor sprayers are considered risky. Dead branches should be removed and the treatment repeated 4 years after the first spraying. Analysis of stem sections 1-3 years after treatment showed that darker protection wood had formed at the bases of killed branches or epicormics, reaching a thickness of 1-2 mm. in the first year, and more later. No signs of cambial injury or incipient decay attributable to the treatment were found. Experiments with other species are in progress. Beech can be 'pruned' with a 0.4% solution.

25. Treatment of Defective, Derelict or Very Open Stands

See also No. 3902.

4076. DREWE, A. F. *Private forestry in South-east England*. *Quart. J. For.* 51 (2), 1957 (121-7).

A Sussex woodland owner describes how he was struck with the potentialities of derelict woodland after the war and how he tackled the problem on his own estate. The article goes on to show how, from this beginning, a company was formed to be known

as Oak-over Forest Services Ltd. to give advice and carry out contract work in Kent, Sussex and Surrey, and discusses the work now being done by this organization. *Author's summary*.

4077. ANDREUCCETTI, E. Origini, evoluzione, struttura e ricostituzione dell'antico 'Bosco di S. Pietro' nel territorio di Caltagirone (Sicilia). [The origin, development, structure, and rehabilitation of the ancient Bosco di S. Pietro at Caltagirone in Sicily.] *Monti e Boschi* 8 (5), 1957 (210-9). [It.f.e.]

The present estate of S. Pietro (4771 ha.) is the remains of a former forest of 27,000 ha. of luxuriant Cork Oak stands destroyed by grazing, fire, and uncontrolled exploitation. An improvement plan is now in operation and the author describes the measures being taken to preserve and improve the surviving Cork Oak forest, the grafting of cultivated scions on wild Olives, planting of Eucalypts in empty spaces, soil conservation, road building etc.

4078. SIMUNOVIĆ, M. Melioracija degradiranje makije resurekcijom i sjetvom alepskog bora nakon pripreme tla požarom. [The amelioration of degraded maquis by coppice regeneration and sowing *Pinus halepensis* on sites prepared by burning.] *Šumarstvo* 9 (3), 1956 (145-56). [Serb.e.f.]

On the island of Mljet, Yugoslavia, 3 plots (a, b, c) of 3.5, 2.3 and 0.5 ha. were established on degraded maquis sites. Existing maquis (consisting of species of the *Quercetum ilicis*) was cut back in summer 1954 to encourage coppicing; in the autumn the plots were burned over and seed of *Pinus halepensis* was sown on (a) at a rate of 2.5 kg./ha., and on (b) and (c) at 5 kg./ha. In addition, barley was sown on (c) at a rate of 15 kg./ha. Data on seedling survival after one year are tabulated. Survival (in % of seedlings present on 1 March) was 96 on (a), 30 on (b) and 76% on (c). On (a) and (b) 2-week-old seedlings suffered severe attack by an unidentified (insect?) pest, while on (c) they were shielded by the barley. The coppiced trees produced numerous shoots, and cleanings were made in summer 1955 when 40% of the shoots were removed. Recommendations for burning and sowing are to make terraces on sloping ground in order to conserve the ash, and to plant barley at a density of 3-5 grains/sq. m. for shelter and soil protection in the first year. [Cf. F.A. 13 No. 1217; 15 No. 1253.]

4079. *Survival of plantings in coastal plain bottomlands*. *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (63-4).

In a 3-year study in S. Carolina on the underplanting of 'rundown' bottomland hardwood sites, both with and without removal of shade, *Quercus shumardii* and *Q. falcata* var. *pagodaefolia* did well under all test conditions. Loblolly Pine grew well on cleared bottoms and terraces, while *Liriodendron tulipifera* and *Juniperus virginiana* survived best on terrace sites. One year of shade tended to improve early survival of all planting stock except Loblolly.

4080. WILLISTON, H. L., and HUCKENPAHLER, B. J. *Hardwood underplanting in North Mississippi*. *J. For.* 55 (4), 1957 (287-90).

A study was made near Oxford, Miss., to find a

suitable hardwood species for introducing into under stocked upland sites. In 1949, 1950 and 1951, 4 plots of 25 trees each were established for 6 introduced species on upper, middle and lower slopes and in a valley bottom. The overstorey of Hickory, Southern Red Oak, Post Oak, Black Oak and Blackgum was killed by poison-girdling before planting, and sprouts and competing vegetation were cut back where necessary. Data are given on the survival and height growth after 4 years for the 5 hardwood species: *Fraxinus americana*, *Quercus alba*, *Liriodendron tulipifera*, *Robinia pseudoacacia* and *Juglans nigra*, and for *Pinus taeda*, which was planted for comparison. The Pine showed the best growth on upland sites; none of the hardwoods proved suited to hilly conditions, and height growth, particularly of Black Walnut, Tulip Tree and Black Locust, increased considerably on lower sites. White Ash had the best survival of the hardwoods, but growth is slow; it is suitable for bottomland and lower slopes where browsing is not a problem. Tulip Tree grew well at first but later suffered severe injury from *Myxosporium* canker. Black Locust became infested by the borers *Ecdytolopha insiticiana* and *Megacyllene robiniae* and was also attacked by mildew. Black Walnut and White Oak are not suitable for large-scale planting. All underplantings need release for satisfactory survival and growth.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

263. Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

See also No. 3940.

4081. TÓTH, B. Az öntözörendszerek fásítási kérdései (első közlemény). [Tree planting on irrigation works (1st publication).] *Erdész. Kutatás., Budapest* 1956 (2), (61–81). 5 refs. [Hu.russ.e.g.]

Tabulates Hungarian data on site factors and illustrates root growth of *Salix* and *Populus* in conditions of saturated soil and excess alkali. *Salix alba* will grow in a soil aerated only to a depth of 30 cm.; *P. alba* requires 40–50 cm. Ridging is advisable. For timber production and to shade main channels (reduction of evaporation and deep seepage) the following are recommended: *Quercus robur*, *Morus alba*, *Juglans regia*, *Prunus domestica*, *Salix alba*, *S. fragilis*, *Ulmus laevis*, *Pyrus pyraster*, *Alnus glutinosa*, *Celtis occidentalis*, *Acer tataricum*, Privet, and probably $\times$ *Populus serotina* and $\times$ *P. robusta*; but, on account of their prolific seeding or suckering, not *Populus alba*, *Fraxinus pennsylvanica*, *Amorpha fruticosa*, *Ulmus campestris* and *Acer campestre*. From author's summary.

4082. Irrigated plantations. *Rep. For. Res. Nigeria* 1954/55, 1957 (12).

Experience in the Gezira with *Eucalyptus microtheca* has shown that good results may be achieved by irrigating for 2–3 months, after the end of the rains, in effect prolonging the rains, instead of irrigating throughout the dry season.

264. Farm Forests

4083. PHILIPPIS, A. DE. Protection for farming and soil stabilization [through Eucalypts]. Round-up of successful methods and research needs. [With discussion.] *Final Rep. World Eucalyptus Conf., Rome* 1956, 1956 (38–43). [E.]

Briefly covers experiences with existing plantings for drainage of marshy areas, as shelterbelts and windbreaks, and for erosion control particularly in Mediterranean countries.

266. Shelterbelts, Windbreaks

See also Nos. 4006, 4024, 4083, 4201.

4084. KUHLEWIND, C., BRINGMANN, K., and KAISER, H. Richtlinien für Windschutz. 1. Teil: Agrarmeteorologische und landwirtschaftliche Grundlagen. [Protection against wind. I. Basic facts of agricultural meteorology and general husbandry.] Deutsche Landwirtschafts - Gesellschaft - Verlags-GmbH., Frankfurt am Main. 1955. pp. 62. 15 refs. [G.] Price DM.4.0 [8s. 3d.].

Discusses general principles, and the advantages, effectiveness, and dangers of various types of wind-break, from 5 years' planning experience in Nordrhein-Westfalen. Types planted or proposed were chiefly single rows of broadleaved trees and/or shrubs occupying ca. 0.5% of the area protected, along roads, watercourses, etc.

4085. HERRAN, K. Die 'Gitterhecke' als Windschutz und Koppelfriedigung. ['Lattice' hedges as windbreaks and for fencing enclosures.] *Int. Holzmarkt* 1957 (5), (46–8). [G.]

Describes, with illustrations, a method by which young saplings planted in rows at suitable distances are interlaced diagonally to give a lattice effect; at the crossings, the two stems are held firmly together with a metal fastening and grow together after 1–2 years. Advantages for windbreaks are that the hedges are only 1–2 m. wide, relatively permeable, and suitable for nesting sites for birds; and, for fencing enclosures, that they save the time and expense of preservative treatment, release wood for other uses, are long-lasting and need little or no attention. To prevent browsing in the first 2–3 years, unpalatable species can be used or the hedge can be protected at first with an electric or barbed wire fence.

4086. LÁDY, G. Egy dombvidéki szintirányú erdősav talajvédő hatásának vizsgálata. [Investigations on the soil-protecting influence of a horizontally established shelterbelt.] *Erdész. Kutatás., Budapest* 1956 (3), (69–81). 10 refs. [Hu.russ.e.g.]

Gives data and graphs to show the differences in the erosion of the humus layer, the CaCO_3 content, and the moisture of a chernozem at various distances to 120 m., up and down slope from a contour-planted single-line shelterbelt 4 m. wide and 8 m. high, of Robinia. In the 40–60 m. strip astride it all 3 factors were improved.

4087. BENKOVITS, K. A legelővédőfásítás hatása a mikroklímára és a fűtermés minőségére. [The influence of tree planting on the microclimate and grass yield of pastures.] *Erdész. Kutatás., Budapest*

1955 (3), (3-18 + smries. in suppl.). 6 refs. [Hu.russ.e.g.]

Compares, over a short period, air and soil conditions of (a) unprotected pastures, with (b) those at various distances from a shelterbelt 20 m.-wide, at right angles to the prevailing wind and (b) effective over an area 25 tree-heights wide. The % increases within (b) in total and dry weight, vitamin C, digestible protein, and starch value were 9, 67.8, 108.5, 144.4 and 85.2 respectively, in spite of rainfall 46.5% above the mean. In the dry season, produced one-third of the normal spring yield while most of the grass in (a) withered. *From author's summary.*

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See Nos. 3674, 4458.

4088. LAY, D. W. Browse quality and the effects of prescribed burning in southern Pine forests. *J. For.* 55 (5), 1957 (342-7). 4 refs.

In the Sieck State Forest, Texas, samples of 28 species of deer forage were collected in 1954 and 1955 from a Longleaf Pine stand on sites that had been subjected to 1, 2 or 3 prescribed burns and from adjacent unburned areas. Ten of the species were sampled for the 4 seasons. Analyses of the nutrient content of the tips at 15% moisture content are tabulated. Burning increased protein content by as much as 42.8%, and P_2O_5 by 77.8%, but these effects disappeared after ca. 2 years [cf. *F.A.* 18 No. 76].

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants.

4089. BUGAŁA, W. Jesiony północno-amerykańskie uprawiane w Europie. [North American species of Ash grown in Europe.] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 11, 1956 (287-301). 8 refs. [Pol.russ.e.]

Describes the history of the introduction of *Fraxinus americana*, *F. pennsylvanica*, and *F. p. lanceolata*, and gives a detailed description of these species. *F. americana* is rarely met with in Poland, but the two other species are often planted along the roadsides.

4090. AMORY, C., JR. Seaside plants defy the elements. *Plants & Gdns.* 12 (4), 1956 (297-9).

Lists species that have been grown successfully on an island off Cape Cod exposed to salt spray, prevailing fair-weather westerly winds, and sporadic storm winds from the east. They include *Ilex opaca*, and other *Ilex* spp., *Pinus thunbergii*, *Juniperus chinensis* var. *keteleeri*, *Fraxinus americana*, *Ulmus procera*, and *Elaeagnus* spp. Many species otherwise promising were set back or killed when their roots were submerged in salt water for several days in the 1954 hurricanes.

28. Husbandry of Forest Products Other than Wood

282. Bark Crops

4091. Fomento da subercultura—campanha de 1956. [The encouragement of Cork Oak cultivation—

the 1956 campaign.] *Bol. Junta nac. Cortiça, Lisboa* 19 (219), 1957 (65-80). [Port.]

The commission for the encouragement of Cork Oak cultivation in Portugal was formed in 1955. A report is presented on the commission's first year of work. This begins with the results of a survey carried out in the most important Cork-growing areas of Alemtejo. The survey covers: (1) areas now devoid of trees, where Cork Oak could be re-introduced, (2) the state of the existing stands, (3) the problem of soil conservation, (4) the problem of regeneration, and (5) the economic position. This is followed by brief reports of heads of sections on the past year's work and future plans. The sections in question cover: inventories and economics; techniques, technical assistance and regeneration; protection; and the biology of Cork Oak.

283. Fruit and Seed Crops etc.

See No. 3738.

284. Crops Tapped for Exudations etc.

See also Nos. 4363, 4780.

4092. TOLKAČEV, A. K., and SINELOBOV, M. A. Sposob podsočki eli. [Method of tapping Spruce.] *Bjulletenij Izobretenij [U.S.S.R.]* 1956 (4), (36). [Russ.] From *abstr. in Gidrol. lesohim. Prom.* 9 (8), 1956. [Russ.] P.R. USSR Patent No. 102,884 of 5.10.1954.

To increase resin yields, the base of the stem is completely barked to a height of 1.5 m. early in summer of the felling year, and the resin is collected 2-3 months later from the bare wood. [Cf. *F.A.* 16 No. 3032.]

4093. VYSOCKIJ, I. V. Itogi ispytaniij racionalnoj tehnologii udlinennoj podsočki sosny. [Summary of results of trials of rational techniques for long-term Scots-Pine tapping.] *Gidrol. lesohim. Prom.* 9 (5), 1956 (12-5). [Russ.] P.R.

Presents 5-year results of trial tappings begun in 1951 on 12 plots near Baranovichy for the purpose of comparing new methods of long-term (10-15 years) tapping with the standard [German V-face, descending freshening] method. The new methods, involving chiefly variants of two-storey tapping, half or whole V-faces, descending and ascending freshenings, and height of face (max. 280 cm.), are described in detail and the results given in a table showing: number of trees (150-222 for each method), number of faces, total number of freshenings per face, tree diameter, crown length (%), face width, space between freshenings (streaks) and resin yield (total per tree, and annual means per face and freshening). The stand and site characteristics were the same in all plots (Scots Pine with small admixture of Birch, age ca. 100 years, on flat ground, site class II, density 0.6-0.7). The best results were obtained with a two-storey descending tapping method with a 'chessboard' arrangement of annual faces (each upper face 25 cm., each lower face 20 cm., broad); the yield (per freshening, face or tree) was 32-33% higher than for the control. [Cf. *F.A.* 16 No. 3036.]

4094. [Intensive resin-tapping methods.] *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (83-4).

By making streaks 1½ in. high [broad] every 2 weeks and treating them with 65% H₂SO₄, a normal season's yield can be obtained from only 12 streaks, preferably from mid-April to mid-October, reducing labour requirements by 25%. For large producers on short-time leases, the method can be used for the full 16-streak seasons for 2 successive years, but is not recommended for faces worked longer. Increase in yield in Slash Pine is ca. 15–20%, in Longleaf 10–15%.

287. Bamboo and Cane Growing etc.

See also No. 4799.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD : LOGGING AND TRANSPORT. FOREST ENGINEERING

See also No. 3626.

30. Work Science (Work Studies): General

See also No. 4848.

4097. BERGSTEN, G. Om tidsstudiers anvendelse i skovbruget. [*The use of time studies in forestry.*] *Dansk Skovforen. Tidsskr.* 40 (10), 1955 (443–92). 40 refs. [Dan.]

Reviews briefly forest time studies carried out in Denmark and elsewhere and discusses in some detail recording methods, treatment of material, and the use of time studies in forestry, e.g. in appraising tools and techniques or fixing wage rates. Includes illustration of specimen record sheets.

302. Man and Work (Physiology and Psychology)

See also No. 3945.

4098. KAMINSKY, G. Arbeitsphysiologische Grundlagen des Leistungsgrades. Möglichkeiten für die Festsetzung einer Bezugsleistung und die Leistungsgradbestimmung beim Sägen. [*Work physiology as a basis for performance rating. Possibilities of fixing a standard, and performance rating in sawing [by hand].*] In *Mitt. Bundesanst. Forst- u. Holzw.* No. 39, 1956. pp. 19. 15 refs. [G.g.]

An analysis of cross-cutting of Spruce logs with a two-man raker-toothed saw. From the point of view of energy consumption, the optimum lay at ca. 45 double strokes/min. with a cut of 22–23 sq. cm./double stroke (i.e. ca. 1000 sq. cm./min.) at 8 Kcal./min. Regression analysis showed a near-linear relationship, with an increase in performance of 10% resulting in an increased energy consumption of 0.9 Kcal./min. *From author's summary.*

4099. KAMINSKY, G. Arbeitsphysiologische Beobachtungen bei der Arbeit mit Motorsägen. [*Observations on work physiology in operations with power saws.*] In *Mitt. Bundesanst. Forst- u. Holzw.* No. 39, 1956. pp. 34. 8 refs. [G.]

The investigations related to work with German power saws, 3 one-man and 1 two-man. Techniques and apparatus are described. It was confirmed that, taking into account the effort of carrying and holding the saw, energy consumption was slightly greater than with hand saws per unit of time, but

4095. BADHWAR, R. L., DEY, A. C., and RAMASWAMI, S. Canes (rattans): their occurrence, cultivation and exploitation in India. *Indian For.* 83 (3), 1957 (216–23 + 2 photos). 11 refs.

Includes recommendations of species suitable for cultivation for special purposes.

4096. PEREZ ARBELAEZ, E. Plantas útiles de Colombia—Bambúseas. [*Useful plants of Colombia—Bambuseae.*] *Mater. Veg.* 2 (2), 1957 (102–11). 26 refs. [Span.e.] E.M.B.

A short bibliography of Bambuseae, a list of the genera, a list of Colombian species and notes on methods of cultivation.

considerably smaller per cu.m. of wood sawn [cf. *F.A.* 18 No. 462]. Differences in weight have considerably more effect above a weight of 11 or 12 kg. Data on vibration and noise are given for each saw. Modifications in weight distribution and number of revolutions is considered desirable for both types and particularly for the 1-man saws. Though injuries to hearing are not expected with the present intermittent system of working, the noise would be dangerous if the saws were used continuously, and a general effect on performance cannot be ruled out. CO concentrations, for work in the open, never reached injurious levels, but other exhaust substances may cause discomfort, and changes in construction, particularly in two-man saws, are recommended to avoid exposure of the worker to direct exhaust fumes [cf. *F.A.* 18 No. 1676].

304. Hygiene. Safety; Accidents and their Prevention

See Nos. 3945, 4099.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 3888, 3945, 3948, 4015.

4100. Equipment section. *Unasylva* 11 (2), 1957 (90–2).

Notes, with illustrations and specifications, on: a spray for marking trees with paint (Nelson Co., Iron Mountain, Mich.); mechanical winch for log loading (Ets. L. Fournier, Ambert, France); electric log loader (Le Tourneau Inc., Longview, Texas); Penetration sprayer and mist blower (Kent Engineering Ltd., Maidstone, Kent); Hyster pulpwood loader (Hyster Co., Portland, Ore.); DFPO hydraulic plywood press (Becker and van Hüllen, Krefeld, Germany).

4101. Smithfield again. *World Crops* 9 (1), 1957 (17–27, 37). O.R.E.

Describes agricultural equipment, ploughs, cultivators, sprayers etc., including a tree-planting machine (the 'Smallford', by Tractor Shafts Co.

Ltd.) designed for trees up to 3 years of age, and strong enough to resist tree roots etc. in former woodlands.

31. Logging and Transport: General

See also Nos. 3887, 4481.

4102. SIMMONS, F. C. **Developments in logging—1956.** *For. Prod. J.* 7 (2), 1957 (45–9). 129 refs.

The main trend in N. America is seen in the fuller utilization of logging sites and individual trees, resulting from the practice of chipping at sawmills, which has led to a lowering of merchantability standards, and more careful cutting up and sorting at timber landings, with an increase in tree-length logging.

4103. EGERTON, J. O. **Notes on a tour of American logging and milling operations.** *Malay. Forester* 10 (1; 2), 1957 (4–12; 91–8 + 8 photos).

4104. KEITH, H. G. **Report on the far eastern mechanical logging training centre of the Philippines (3rd October, 1952 to 24th March, 1953).** *Philipp. J. For.* 10 (1/4), 1954 (1955), (115–87 + 19 plates).

4105. TAMWORTH, I. P. **A review of the methods of organizing exploitation in the tropical rain forests of Malaya.** *Malay. Forester* 20 (2), 1957 (67–71).

Notes on labour conditions, roads, sale of logs, and species exploited.

4106. CERMAK, F. **Die Teckreinbestände auf Java und ihre Nutzung. [The pure Teak stands of Java and their utilization.]** *Schweiz. Z. Forstw.* 108 (3), 1957 (175–88). [G.f.]

A general account of the natural and planted Teak forests, their management, establishment and yield, dealing more particularly with techniques of logging, transport and primary conversion, and utilization %, including mill equipment and its most common faults, from the author's own experience. [Cf. *F.A.* 18 Nos. 4125, 4809.]

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

See also Nos. 3696, 3771, 4149–51, 4675, 4712.

4107. MOLTESEN, P. **Bør vi ændre vor skovnings-tid? [Should we alter our felling season? [with discussion].]** *Træindustrien* 6 (12), 1956 (150–2); 7 (1; 2), 1957 (7–8; 18–21). [Dan.] P.R.

The traditional felling season in Denmark is January to March. Felling season appears not to affect wood quality (e.g. by increasing or reducing fungus damage) except that there is some evidence that October-felled hardwoods may be more difficult to impregnate, because of tylose formation; more research is needed on this last point. Oak should preferably be felled in autumn, because discoloration takes place from May onwards. Figures show that only 25 % of the annual felling is done in October–December. Some of the advantages to the forester and the user of a longer felling season are considered. The discussion after

the paper raised other points for and against such an extension.

4108. BERKLUND, B. L. **Chemical debarking of wood.** *Tappi* 40 (3), 1957 (180A–182A). 4 refs. P.R.

Describes observations and experiences with the local scrub Oak which could normally be expected to be in full foliage by 30 May. Barking operations were never started before 25 May. In 1954 the treatment with arsenicals began when the leaves were only 1 in. long, and no difficulty was later experienced in drum barking. Locally on sandy soils the sap-peeling period (and probably also the period of cambial activity) is relatively short, and difficulty in bark removal is experienced by ca. 20 July. It was found that bark slipping responds to weather conditions (hot dry weather creating barking problems that were absent after heavy rains). The treating season for Oak on sandy soils is from 25 May to 25 July. Fresh-cut scrub Oak was always drum-barked with good results one month after treatment, but reduced peelability was sometimes experienced on standing treated trees after October; in the following spring, however, the barking results were again 100%. The techniques, hazards, production rates, costs, and general merits of chemical barking are discussed.

4109. COOK, D. B., and WELCH, D. S. **Back-flash damage to residual stands incident to chemi-peeling.** *J. For.* 55 (4), 1957 (265–7). 1 ref.

In summer 1954 in the Cooxrox Forest, N.Y., thinnings were made in one Red Pine and one Dunkeld Larch stand, of trees that had first been treated with Na arsenite. Three untreated Pine and one Larch that had died by the following spring were dug up; all had root-grafts to a treated tree. The effects of 'backflash', i.e. mortality from root-grafting with a poisoned tree, can be limited by treating as late in the season as possible.

323. Felling and Subsequent Primary Conversion

See Nos. 4098, 4114–24, 4702, 4731–2.

325. Sorting and Assortments of Wood in the Rough

See Nos. 4127–8, 4489–91, 4739.

326. **Sequence of Operations (including Felling Instructions, Primary Conversion after Extraction, Composition of Gangs, One-Man Work etc.)**

See Nos. 4110–1, 4126–7.

33. **Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood**

See also Nos. 3891, 4102, 4124, 4129, 4133.

4110. SPROULL, R. C., PARKER, R. B., and BELVIN, W. L. **Whole tree harvesting.** *For. Prod. J.* 7 (4), 1957 (131–4).

Advocates a new approach involving integrated utilization of the whole tree (stump, roots, slash, and bark, using land-clearing equipment for up-rooting the trees), and discusses economic implications. A preliminary study compared wood

properties, fibre dimensions etc. from various parts of Pines (Slash and Longleaf). Good yields of high-quality pulp were obtained from all parts. Stumpwood had lowest density and yielded poorer chips, but had the longest fibres. Roots and branches gave the lowest yields.

4111. SIMMONS, F. C. Full tree utilization in West Virginia. *For. Prod. J.* 7 (4), 1957 (60...64).

Describes the integrated operations of the Meadow River Lumber Co. at Rainelle, W.Va., covering felling and trimming (at \$1.0 per tree irrespective of size), tree-length skidding, hauling and loading (including equipment), sorting, grading and cross-cutting at the mill, chipping of waste and culled pieces, etc. Increased rail-transport costs for tree-lengths are more than offset by more careful cross-cutting, improving the lumber grade, and additional wood for chipping.

4112. ROSEBERRY, R. D. Results of a re-logging experiment in a selectively cut mixed-conifer timber stand. *For. Prod. J.* 7 (5), 1957 (37A-38A).

Tabulates data on the amount of timber and bark-free chips (by species) obtained from ca. 60 acres of old growth with some regeneration in the Sierra Nevada, Calif., by lowering log size standards from 10 ft. $\times$ 10 in. at top to 8 ft. $\times$ 6 in., and quality standards to logs suitable for chipping only, and cutting some smaller trees where silviculturally advisable. The second harvest was 17% of the first, and the operation helped to reduce fire and insect hazards.

4113. OHLSÉN, B. Hugging, bunting og transport av klenvirke. [Felling, bundling and transport of small wood.] *Svenska SkogsvFören. Tidskr.* 53 (3), 1955 (239-74). 4 refs. [Sw.sw.e.]

Methods and equipment used in bundling the small wood are shown in photographs. The study was made in a young Scots Pine stand, d.b.h. 3-3.5 cm. o.b., with a stocking of 7000-13,500 stems/ha., of which the operation left ca. 3500/ha. Results of time studies on cleaning, with and without removing and preparing (trimming and bundling) the small wood ($\frac{1}{2}$ -2 $\frac{1}{2}$ in. diam. at 3 m.) are given in graphs and tables. The mean outturn of small wood was 5.9 solid cu.m. o.b. per ha. Results of further time studies on horse hauling to the motor road and on mechanical loading on to lorries are tabulated. An analysis of costs showed that felling (including sorting out the small wood) and trimming are the most expensive items, followed by bundling. Total costs for felling and preparing, horse-hauling 300 m. and lorry transport over 50 km. were Kr.32.63 (green wood) or Kr.30.89 (wood dried in the forest), and for lorry transport over 100 km. Kr.36.53 or 34.17.

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

See Nos. 4150-2, 4699-4702, 4711-2, 4714, 4729-32, 4734.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also Nos. 4098, 4113, 4128.

4114. NIXON, C. R. W., and GUNN, D. C. Felling and bucking time studies. *B.C. Lumberm.* 41 (4), 1957 (24...32).

Methods of felling and cross-cutting are discussed and time-study data tabulated and graphed from one-man operations on 1096 trees (5 species), in the Southern Interior, British Columbia. The effects of log length (short, long and tree-length), species (Fir, Larch, Spruce) and diameter (12-40 in.) are analysed.

4115. MAKKONEN, O. Ehdotus pistejärjestelmän mukaisiksi hakkuutöiden palkkataulukoiksi: työn-tutkimustulosten sovellutus. [Proposal for felling-work wage tables according to the points system: a practical application of time-study results.] *Tied., Metsäteho, Helsinki* No. 125, 1956. pp. 30. [Fi.]

The points system was outlined in a previous work by the same author [see *F.A.* 12 No. 3071].

4116. MAKKONEN, O. Koivu-, haapa- ja kuusi-paperipuiden teko: työntutkimus. [Preparing Birch, Aspen and Spruce pulpwood: a work study.] *Julk., Metsäteho, Helsinki* No. 37, 1957. pp. 73. 9 refs. [Fie.e.]

Gives, in tables and graphs, the results of studies on the effect of distance between trees, the relation of felling, trimming and cross-cutting and barking time to volume utilized, relation of barking difficulty to season, time taken in aspects of crosswise stacking of pulpwood that cannot be related directly to the stem, distribution of total working time between the different work phases, and the total working time by species or season.

4117. HEISKANEN, V. Laadun vaikutus mäntysahatukkien tekovaikuteen. [The influence of log grade on the cutting difficulty of Pine sawlogs.] *Commun. Inst. for. Fenn.* 45 (8), 1956. pp. 59. 40 refs. [Fie.e.]

Results of work studies on the effect on trimming and barking times of log grade and/or knottness class (which are closely related), on two different sites. Total times, including felling and cross-cutting were ca. 7-13% less for log-class I, and ca. 10-21% more for class III, than for class II. These differences, while greater than those allowed for in present Finnish wage schedules, based on branch size, do not adequately reflect the position either. New ways of difficulty classification for wage calculations are considered desirable.

4118. Time study of felling, lopping [trimming] and barking of *Pinus silvestris* in the forestry in the Netherlands. Landbouwhogeschool, Wageningen. [1957] pp. 10 + 1 map, 16 gphs. [E.] Limited distribution.

Interim results of time studies in 1954-56 in different conditions are shown in graphs. The main factors considered were: for felling, presence and absence of undergrowth, whether the operation was thinning or clear felling, and whether 1 or 2 men were employed; for trimming, number and thickness of branches; and for barking, the season (spring/summer, or autumn/winter without frost). Equations are given for time taken by the different combinations. In a time study on planting 2-year Pine on sandy soil, comparing the use of one or of 2 men, a

wooden planting wedge, an auger or a hoe, the best combination was one-man planting using the wedge.

4119. ECKERT, K.-H. Die Herleitung der Entästungszeit aus einfachen Kronenmassen bei der Fichte. [Deducing trimming time for Spruce from simple crown dimensions.] *Forstarchiv* 26 (10), 1955 (224-7). 9 refs. [G.]

Measurements were made on 105 Spruce, in various parts of Germany, of two crown breadths at right angles ($2 Kb$), live crown length (Kl) and tree height (h). The time required for trimming these trees after felling was significantly correlated with the value $B = 2 Kb + Kl + h$. A table shows pure working time in trimming as related to (a) d.b.h. (figures taken from an existing 'tree-time' table), and (b) the value B . Since (a) is used as the standard time, the difference (a)-(b) gives the time to be added or deducted, per tree, for stands with abnormal crowns. To convert the pure working time to the standard job time, the former is increased by 30%. The value of B must be ascertained, from < 12 trees representative of those being felled. Only in extreme cases where trimming is made specially difficult by excrescences on the bark, the nature of the wood, or very abnormal spacing of the branches, is there any need for extra time studies; in the majority of cases the table can be used direct.

4120. HILF, H. H., and ECKERT, K.-H. Festmeterzeittafeln für Buche und Fichte. [Time tables for performance, in solid c.u.m., in the felling and primary conversion of Beech and Spruce.] *Forstarchiv* 27 (5), 1956 (109-12). 4 refs. [G.]

Extracts are given from tables based on time studies on 1900 Spruce and 1400 Beech trees. The time values represent the normal performance of a 2-man team in unimpeded conditions (including light falls of snow and slopes with a gradient of < 25%). The extra time required where the gradient is > 25% is shown in an additional table. [Cf. *F.A.* 18 No. 1660.]

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 3945, 4099, 4100, 4143, 4596, 4601, 4604.

4121. SALMINEN, J. Sahatukkien kuorintaa kutterikoneilla. [Barking sawlogs with cutters.] *Tied., Metsäteho, Helsinki* No. 130, 1957. pp. 8. [Fie.]

Briefly describes the Jackson Barker from the U.S.A. and, in more detail, the Finnish Veikko III. The latter is constructed for logs of varying length, diam. 4-24 in., and has two specially designed cutters. There are different models for barking frozen and hardwood logs and unfrozen softwood logs. Feeding is by adjustable wheels, and feed speeds range from 4 to 15 m./min. according to diameter and type of bark. Barking waste is removed by blowing. The power requirement is 10-15 h.p. Price, including electric motor, is ca. Marks 860,000. The barker can be either a mobile or a stationary unit. It needs a crew of 2-4, and can bark 400

logs in 8 hours. Barking is satisfactory for pulpwood chip production. Waste is insignificant and costs are low. *From author's summary.*

4122. DRAKULIĆ, J. Određivanje nekih optimalnih uslova rezanja jedne motorne pile za hrast, jasen, bukvu i smrčū. [Determining the best conditions for cutting Oak, Ash, Beech and Spruce with a power saw.] *Šumarstvo* 9 (8/9), 1956 (449-72). [Serb.e.f.]

From studies on logs of *Quercus robur* s.s., *Fraxinus excelsior*, *Fagus moesiaca* and *Picea abies*, the angle α (complement of the front bevel angle) of the cutting and raker tooth of the Yugoslavian 'Rinko' chain saw, is calculated for each species, based on the highest output with the most economical use of fuel. Data are also given for calculating the working life of the chain.

4123. LEBACQ, L. Mécanisation de l'abattage et du tronçonnage en exploitation forestière. [Mechanization of felling and cross-cutting.] *Bull. agric. Congo belge* 48 (2), 1957 (371-86). 1 ref. [F.du.]

Using 2-man power saws, felling and cross-cutting cost respectively 22% less and 28% more than hand methods, while savings in labour were 75 and 70% respectively. Recommended felling procedure is: one power-saw makes 2 horizontal cuts on the falling side, $\frac{1}{3}$ of the diameter ($D/3$) deep and $D/3$ to $D/5$ apart. A third man removes the slice with hammer and wedge. A second power-saw makes a horizontal cut on the back side, level with the upper falling cut, and wedges keep this open while a sixth man topples the tree. In larger trees 2 slices are cut, the lower one not so deep and the step thus made gives a check to the fall of the tree.

4124. MIRON, V. Contribuții privind folosirea defrișatorului D-210-V la desrădăcinarea salcîmului. [The use of the D-210-V stump-grubbing machine for uprooting Robinia.] *Rev. Pădurilor* 71 (7), 1956 (439-43). [Rum.]

An illustrated account of the successful use of this Russian machine, which will uproot trees between 0.4 and 1.5 m. in diameter.

37. Transport

See also No. 4734.

372/377. Land Transport

See also Nos. 3898, 4100, 4102-6, 4110-1, 4113, 4364, 4481.

4125. MIEDLER, K. A. Report to the Government of Burma on mechanization of Teak extraction. Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 614, 1957. pp. 53 + 2 maps, 3 gphs., 15 photos. 10 refs.

Describes an experimental extraction unit. The appendixes include mathematical considerations, list of equipment, principles of road construction, haulage costs, unloading device, and equipment needed for a Teak extraction unit with a capacity of 20,000 tons/year. [Cf. *F.A.* 18 No. 4106.]

4126. VOLKERT, E. Die Bringungstechnik als gemeinsames Problem von Forst- und Holzwirtschaft. [The technique of wood transport—a joint problem of forestry and the wood industry.] *Schrieihe forstl. Fak. Univ. Göttingen* No. 16, 1956. pp. 104. 36 refs. [G.]

A theoretical and practical analysis of the complex relationship between density and quality of the road network and the techniques (including equipment) of skidding, and of short-and long-distance hauling, tracing the changes inherent in progressive mechanization of roadbuilding and transport. The author divides the transport process into a few typical phases and methods for (a) long wood, (b) industrial short wood (pulpwood and mining timber), and (c) fuelwood. On this basis, he analyses transport operations in the Hann. Münden instruction forests of Bramwald (1943 and 1953) and Kattenbühl (1953), with reference to the ultimate destination or points of trans-shipment (rail and water) of (a), (b) and (c), and the methods of transport used. Time studies on (b) emphasized the great superiority of skidding long logs and converting them at the roadside, rather than converting either at felling site or at destination. The cheapness, in most instances, of transport direct from roadside to destination was also brought out clearly. From an analysis of expenditure on road building and maintenance, discussing the costs of various types of surface and the requirements as to surface width, curves, gradients etc. for modern transport, combined with the costings based on time studies of skidding operations, the author presents diagrams for working out optimum road-net densities for various conditions (site, wage rates, and road maintenance costs for level and hilly country). For Beech of site class III, and with maintenance costs of DM.1.0 per linear m. annually, the optimum road spacing is given as 600–750 m., compared with a mean distance at Kattenbühl of 435 m.

4127. BONNEMANN, A. Das sortenweise Rücken. [Skidding by assortment.] *Forstarchiv* 28 (4), 1957 (78–82). [G.]

Extraction procedure in the forest district of Gahrenberg is described. After felling, timber and cordwood are stacked and skidded separately and are arranged by assortments at a log dump at the roadside. Details of costs and the equipment used are given. This method of skidding is preferred for its cheapness, and because it causes little damage to young growth.

4128. MAKKONEN, O. Työntutkimuksia jalkamittaisten havupuurankojen hakkuusta ja ajosta Pohjois-Suomessa. [Work studies on felling and hauling 'long logs' measured in feet in northern Finland.] *Tied., Metsäteho, Helsinki* No. 129, 1957. pp. 6. [F.i.e.]

In time studies in the winter of 1956, utilization of small stems was more complete for long logs measured in feet (12–23 ft.) than for standard 2-m. pulpwood, but larger stems were better utilized by cutting into 2-m. lengths, because payment for pulpwood lengths was by the piece, and for long logs by volume, and in the latter case, where a thin top

adds little to the volume, the men did not bother to cut logs to a very small diameter. Long logs took less time to fell and cut than pulpwood, but other preparation of the long logs (e.g. length marking at the top end for later measurement, and stamping with floating marks) absorbed most of the time saved. Loading and unloading long logs took longer, largely because they had to be tied to the sledge, whereas pulpwood was loaded into racks. Total felling and hauling time for Pine and Spruce long logs took 2 and 1% respectively longer than for a corresponding amount of 2-m. pulpwood. If tying on the sledge could be obviated by the use of some form of removable side piece, logging long logs would probably be more advantageous than logging of pulpwood lengths. *From author's summary.*

4129. HEDMAN, N. A. Lunning med vinsch: några värmändska synpunkter och erfarenheter. [Winch skidding: observations and results from Värmland.] *Skogen* 44 (10), 1957 (342–3, 356). [Sw.]

After preliminary tests in 1955–56 in N. Värmland, the 'Domänvinschen' used was modified; the new model comprises a $9\frac{1}{2}$ -h.p. motor driving a single one-drum winch (2 in the original model), is mounted on a sheet-metal Lapland sledge, and weighs 175 kg. compared with 400 kg. for the original model. In 1956–57, trials were made in removing thinnings at the rate of 35 cu.m./ha. from a medium-aged stand to the tractor road, using the modified winch aggregate and 100 m. of 6.5-mm. wire. Pulpwood was loaded on to 2 sheet-metal yarding sledges, weighing 14 kg., and for larger material the 'Domän-saxen' (specially constructed tongs) were used. A crew of 2 carried out the loading, winching, and stacking at the roadside. Costs were 26% lower than in neighbouring areas, although wages were higher. The average time was 19.3 min. per man and per cu.m., the mean load 0.9 cu.m., the amount moved 20.2 cu.m./6½-hour working day, and the cost Kr. 3.96/cu.m., with a daily wage of Kr.40 per man. The main factors affecting the results are: (1) distance of the limit of the working area from the road (> 125 m. for similar results); (2) amounts to be moved (< 30 cu.m./ha.); and (3) snow cover and nature of terrain (bare ground or light snow, moderate slopes). Advantages include less damage to the residual stand than with horse skidding, and the possibility of working all the year round. Further research is desirable.

4130. IRIE, T. [Theory of the aerial cableway considering on the expansion and contraction of rope length caused by its elastic deformation and change of temperature.] *J. Jap. For. Soc.* 38 (4), 1956 (141–6). 7 refs. [Jap.jap.e.]

The expansion and contraction of the length of the cable has some effect on it in a state of static equilibrium. The calculation method used for cables with a single load is here used for those with multiple loads. A numerical example for the bi-cable system with two carriage loads is presented.

4131. PORTABLE SPARS. *Timber of Canada* 18 (3), 1957 (24–5).

Gives construction and operational details of the portable spar made by S. Madil Ltd. of Nanaimo, B.C. Mounted on a lorry, the spar is raised by a 5-stage hydraulic ram. It is in use on a Campbell River (Vancouver Is.) logging area.

4132. MATSON, E. E. **Logging experiments run with a 'Swiss watch'.** *B.C. Lumberm.* 41 (4), 1957 (23).

Includes a table of costs for yarding 2 million bd. feet to a forest landing by Wyssen Skyline Crane. A new model of 5-ton capacity suitable for second- and small old-growth Douglas Fir, with a 5-man crew, can yard 5000-6600 bd. ft./hour from a clear-felled felling site.

4133. WORTHINGTON, N. P. **Skidding with horses to thin young stands in Western Washington.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 138, 1957. pp. 7. 2 refs.

Data on skidding costs are tabulated. Under normal conditions the average cost is \$4 to \$6.50 per cord. Daily production for one man and horse is 3.5 to 6 cords.

4134. SAMSET, I. **Tømmertransport med hest og traktor på snepakkete veier.** [Transporting timber by horse and tractor on compacted snow roads.] *Medd. norske Skogforsøksv.* 13 (4), (No. 47), 1956 (325-740). 6 pp. of refs. [Nor.e.e.]

In observations made between the winters of 1948-49 and 1953-54, two horses, 6 tractors, and 3 types of horse sledge and 3 of tractor sledge were used. The roads were compacted in the first place by tractor, and compaction was maintained by the horse or tractor traffic; horse- or tractor-drawn graders were used to keep the surface level. The statistical treatment of the material collected is described. Results, including data on friction, driving time, variation of speed with load, snow temperature and gradient, loading times, breaking strength of compacted snow, and rolling resistance of vehicles, are given in graphs and tables. There is a 30-page English summary.

4135. COBB, B. C. **Logging with farm tractors.** *Sth. Lumberm.* 194 (2425), 1957 (72...76).

A work study and cost analysis of 14 logging operations using horses for bunching and tractors of 26 to 40 h.p. (Ford, Ferguson, etc.) for skidding distances from 400 to 3500 ft. under a great variety of conditions. The method seemed to work best with medium-size timber, skidding downhill with near-capacity loads. Gradients > 40% and loads > 700 bd. ft. were beyond the capacity of wheeled tractors.

4136. LOYCKE, H. J. **Wege wirtschaftlicher Verwendung von Radschleppern in Forstbetrieben.** [The economic use of wheeled tractors in forestry.] *Forstarchiv* 28 (5), 1957 (93-9). [G.]

States general principles to be followed in the choice and maintenance of wheeled tractors in forestry.

4137. CERCHEZ, G. **Un nou tractor sovietic pentru cosul și apropiatul lemnului.** [A new Russian tractor for the skidding and hauling of timber.]

Rev. Pădurilor 71 (6), 1956 (391-3). 2 refs. [Rum.]
Specification and description of performance of the TDT-54 tractor.

4138. LEPITRE, C. **Le débardage avec tracteurs à pneus.** [Extraction by rubber-tired wheeled tractors.] *Bois For. Trop.* No. 52, 1957 (29-43). 5 refs. [F.]

Discusses the merits and uses of wheeled tractors with rubber tyres, describes several types at present available (with specifications and photographs) and gives some account of their increasing use in N. America and West Africa.

4139. LE RAY, J. **Arche à pneu ou arche à chenilles.** [Rubber tyres or crawler tracks for logging arches.] *Bois For. Trop.* No. 53, 1957 (33-8). [F.e.span.]

Gives some account of the increasing use of wheeled arches with pneumatic tyres, especially in tropical African forests, with some data on methods and costs of converting tracked arches to wheels, and adds a short list of the principal manufacturers of rubber-tired arches. [Cf. F.A. 18 No. 2935.]

4140. KURZ, H. **Der Einachser Höllhof, ein neues Transportgerät zur Bringung von Schicht- und Kurzholz im Gebirge.** [The single-axled Höllhof, a new device for extracting cordwood and short logs in the mountains.] *Forstarchiv* 27 (12), 1956 (287-8). [G.]

Describes and illustrates the trailer, for use on the ridge extraction road. A sledge is partially or wholly loaded on it, being kept in position by cable from a winch mounted on the tractor (Unimog). Data on weight, size and cost are given.

4141. HEDEGÅRD, B. **Konstruktionstävlingen 'Bättre släpfordon till hjultraktorn'.** Sammanfattande redogörelse för resultat och erfarenheter från tävlingen. [The design competition 'Better trailers for wheel tractors'. A summary report on results and experience derived from the competition.] *Svenska SkogsvFören. Tidskr.* 54 (4), 1956 (315-82). [Sw.] [Cf. F.A. 17 No. 1658.]

4142. TERNSTEDT, B.; FREDÉN, E. [Motor transport in Swedish forestry.] *Svenska SkogsvFören. Tidskr.* 54 (2), 1956 (141-79). [Sw.]

Two papers, giving data on amount carried, costs, roads etc., read at the annual meeting of Svenska Skogsvårdsförening, 1956; with discussion.

4143. **Logging equipment.** *Pulp Paper Mag. Can.* 58 (5), 1957 (228...236, 241).

Articles included cover: the Michigan pulpwood logger Model 75 (J. A. McNally); tree length delimber (D. C. Horncastle); small tractors on pulpwood operations, (G. Dumaine); self-loading pulpwood trucks (R. O. Sheppard); loading and unloading the experimental pulpwood rail truck (A. J. DeWhalley; A. Michaud).

4144. WHITE, W. B. **A progress report on prototype special pulpwood car.** *Pulp Paper Mag. Can.* 58 (4), 1957 (154-7).

An illustrated description of a railway truck (capacity 29 cords) with frame-supported metal mesh sides opening upwards, suitable for the safe

fast carriage of pulpwood, with easy loading (manual or crane) and unloading (by rolling or by pusher blade). Loading and unloading times, in initial tests, are indicated.

378. Water Transport

See also No. 3771.

4145. FRANZEN, H. Försök med avlastning av virke från bil. [Tests on unloading and launching timber from a lorry.] *Årsb. svenska Flottledsförb.* No. 30, 1956 (1957), (5456-60). [Sw.]

Describes, with illustrations, an articulated ramp that can be adjusted to different angles to, and heights above and below, water level.

4146. GECOW, R. Nowy sposób zbijania tratwę przy użyciu gotowych elementów. [A new method of making flat rafts by using ready-made connectors.] *Las Polski, Warszawa* 31 (1), 1957 (22-3). [Pol.]

A novel rafting device developed by Sikora in 1953 consists of replacing any tie-poles, nails, chains, pins etc. by a special connector. This consists of a round steel rod 18 mm. diam. and 1 or 2 m. long, the ends being bent into rings, forming keepers for a number of wedge-shaped dogs [illustrated] riding freely along the rod. Their dimensions are: length 115 mm., thickness 6-7 mm., width 45 mm., the bottom part tapering to 16 mm. and sharpened. Special claw levers are provided for extracting the device when dismantling the rafts, after which it can be used again. The number of dogs per metre-run of rod is 4-5, not more than 2 dogs being driven into each log. It is calculated that the cost of these connectors is repaid after 9 floatings.

4147. HEISKANEN, V. Laadun vaikutus mäntysahattukien uimiskykyyn ja uittohankaluuteen. [The influence of log grade on floatability of Pine sawlogs.] *Commun. Inst. for. Fenn.* 45 (1), 1956. pp. 24. 25 refs. [Finn.]

In this study, floatability is computed from measurements of floating depth (draught) and its increase during floating. Though initial buoyancy is generally greater in knotty logs than in clearer ones, partly because they include a greater % of the more buoyant top logs, no differences of practical significance were observed in the floatability of different grades. Position in stem, diameter, and floating time are more important. *From author's summary.*

4148. NYLINDER, P. Undersökning över flytbarheten hos helbarkad två-meters massaved av tall. [Study on the floatability of completely barked 2-m. Pine pulpwood.] *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 5, 1956. pp. 9 + 6 gphs. [Sw.]

One hundred logs were studied. Results, given in graphs and tables, show that: (1) uptake of water increases with decreasing diameter and increasing annual ring breadth; (2) risk of sinking rises in the autumn of the year following launching, being 0.3% in August after 10 months' floating and 4.5% in October when the limit of floatability is taken as 950 kg./cu.m., or 0.1 and 2.0% respectively with a limit of 975 kg./cu.m. Allowing for differences in material, these figures for sinking risk correspond

sufficiently with those from similar investigations [see following abstracts and *F.A.* 18 No. 1712].

4149. NYLINDER, P. Den sommarhuggna sulfatvedens flytbarhet och skader efter ett år vattenlagring. [Floatability of summer-felled sulphate wood and damage after a year's storage in water.] *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 6, 1956. pp. 20 + 25 tpls. 4 refs. [Sw.]

The material consisted of 450 Pine logs each, (a) strip-barked, (b) completely barked and floated, (c) completely barked and stored in a ring boom. Sinking risk (limit of floatability 975 kg./cu.m.) in mid-September, ca. 1 year after launching, was 0% for (b) and (c) and 2% for (a), and a month later 0.1 and 3% respectively. The influence of good drying on floatability is emphasized. With completely barked logs, risk of sinking is confined mainly to those with top diam. < 3 in. and for strip-barked logs < 4 in. With strip-barked and to some extent with completely barked logs, sinking risk is greater in butt logs of 2-log trees. Floated pulpwood absorbed rather less water on average than that stored in a ring boom, but the spread of values was greater. Storage defects (rot and bluestain) were slightly more extensive in completely barked wood but would be insufficient to cause degrade if the pulpwood is used by the winter after floating. Results are tabulated.

4150. JOHANSSON, F. Studier över torkning, vattenupptagning och lagringsskador hos helbarkad sulfatved i Värmland. [Studies on drying, water absorption, and storage damage in completely barked [Pine] sulphate wood in Värmland.] *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 7, 1956. pp. 31 + 29 tpls., 4 photos, 1 map. 19 refs. [Sw.]

Trees were felled at monthly intervals from April till November, 1955, barked and laid off in logs, and stored in the forest. In November all logs were stored in log dumps at the roadside until mid-May, when they were taken to the nearest floating channel and floated in a boom. Logs were weighed at intervals throughout land and water storage and finally in August after 3 months in the water, when damage by rot and stain fungi was assessed. Results, and data on weather during the period, are shown in graphs and tables. Green density at time of felling was lowest for logs felled in July and highest for those felled in June and November. Drying of logs was most rapid in July. Logs felled in September dried very poorly and were still above fibre-saturation point in May of the following year; these showed the highest sinkage % after 3 months' floating. Rot damage in Nov. 1955 and August 1956 was insignificant, but the stain was considerable especially in logs felled in July or earlier.

4151. TUOVINEN, A. Parantaako rasiinkaato kuorellisten mäntytukien uimiskykyä. [Is the buoyancy of unbarked Pine logs improved by felling to season with tops intact?] *Tied., Metsäteho, Helsinki* No. 126, 1956. pp. 19. 9 refs. [Finn.]

Results of measurements on density, heartwood %, and floating losses in poorly and well stored logs are given in graphs and tables. Sinkage at launching of well stored logs was 12.2% for timber,

summer-felled and seasoned with crowns intact and launched early, and 2.4% for that launched later; it was 1.3% for winter-felled timber. During loose floating, summer-felled timber floated well, but loss with winter-felled timber rose to 6.9%, with similar results for the period when the logs were in bundles; when the bundles were unfastened, loss for winter-felled logs was 10.2% and for summer-felled logs 4.0%. Loss of badly stored winter-felled logs was high even at first launching. Tarring the ends of logs improved results with winter-felled but not with summer-felled logs. *From author's summary.*

4152. LEBLANC, L. **Hardwood flotation studies and their applications.** *Pulp Paper Mag. Can.* 58 (5), 1957 (242...272). 2 refs.

A detailed study to determine practicable methods of reducing sinking losses in (1) White Birch, (2) Yellow Birch, and (3) Poplar. Factors considered are (a) felling season, (b) launching season, (c) bundling, (d) painting log ends, (e) mechanics of bundling, booming and towing in dead water. Some conclusions are: if (1) is cut at any season and bundled and launched in the towing season, losses at mill will be negligible; (2) will float for at least 2 months if cut in full leaf, painted and bundled and launched in the spring or autumn. Both species suffer heavy losses if bundled on ice. Bundles of (3) launched in May or later float well for the entire season. Seasoning is the most important factor of floating.

4153. Undersøkelser av bunntømmer. [Research on sunken logs.] *Beretn. norske Skogforsøksv.* 1956, 1957 (20-1). [Nor.]

Tests have been started on samples of Pine and Spruce logs salvaged from different floating channels and estimated to have been under water for periods up to ca. 150 years. Results are so far inconclusive. No correlation was found between time under water and properties so far tested. No difference in chemical content and dry density was found between sunken and fresh timber. Swelling and shrinking appeared to be slightly less, and strength properties, especially in bending, rather lower, for sunken timber. Sunken Spruce logs could be treated with creosote or salts by both pressure and hot-and-cold methods; preservatives penetrated to the depth to which the logs had taken up water and in smaller logs often right to the pith. These results may be important for preservative treatment of Spruce. [Cf. *F.A.* 18 No. 4595.]

4154. PERTOVAARA, H. Pintavirrankehittäjä ja piikkirullat. [Current makers and spike rollers.] *Metsät. Aikak.* 1957 (5), (150...156). [Fie.]

Describes briefly [with illustrations] available current makers and spike rollers developed to speed up timber handling during floating, and compares their profitability. *From author's summary.*

4155. FITZMAURICE, J. J. **A new type of high capacity log slasher.** *Pulp Paper Mag. Can.* 58 (4), 1957 (166...173).

Describes the installation improvised for (a) the sorting of 600,000 cords of river-driven 4- and 12-ft. bolts, (b) the return of part of the former to the

river, (c) the dispatch of a part of the latter to the company's slasher, (d) the slasher itself. Labour costs were reduced by 84% and other savings are indicated. Some increase in maintenance costs is expected.

38. Forest Engineering

383. Roads and Bridges

See also Nos. 3666-8, 4134, 4458, 4484-6.

4156. CAMPBELL, P. W. E. **Notes on forest road construction.** *Malay. Forester* 20 (1), 1957 (14-9 + 2 photos).

General notes, with special reference to Malayan conditions.

4157. AGER, B. H. Den snöpackade vägen. II. Väderlekens betydelse. [The compacted snow road. II. The significance of the weather.] *Svenska SkogsvFören. Tidskr.* 53 (2), 1955 (201-30). 13 refs. [Sw.sw.e.]

[Cf. *F.A.* 17 No. 1684.] The theory of the process of freezing in roads, based on measurements, is discussed. Temperature and radiation are of primary importance, and atmospheric humidity and wind (except when drifting occurs) of secondary importance. Even a thin layer of fresh snow insulates the road from atmospheric influence. Compaction should be avoided just before or during the passage of a warm front, which is usually followed by fresh snowfall; if it is left for 1-2 days, transport can often begin within 24 hours and without further treatment.

4158. LEIJONHUFVUD, A. C. Den snöpackade vägen. III. Fältförsök och praktisk tillämpning. [The compacted snow road. III. Field studies and practical application.] *Svenska SkogsvFören. Tidskr.* 53 (4), 1955 (337-94). 12 refs. [Sw.e.e.]

[Cf. *F.A.* 17 No. 1684 and preceding abstract.] Tests were made using the tractors (1) Cletrac OC 3, (2) Domän Weasel (similar to the Canadian Weasel) and (3) a wheel tractor, Volvo T.31, supplied with a complete set of tracks; (2) and (3) are illustrated. Roads were made by compaction alone (use of the tractors only), or by compaction plus 'processing' (use of drags, wooden roller, spring-tooth harrow or disc harrow pulled by the tractor). Results include the following: Processing with the drag or roller gave roughly the same surface hardness. Harrowing plus rolling gave greater surface hardness and density than rolling alone; harrowing is most effective in late winter, and disc-harrowing is preferred to spring-tooth harrowing. Processing with (3) + roller + modified drag gave better results than without drag. Ripping up the surface of a compacted road to a depth of 25 cm. and reprocessing with (3) + roller + modified drag gave a negligible increase in hardness. Only (2) gave a trafficable road without further processing, while with (1) and (3) compaction and an interval followed by processing were necessary. (1) and (3) gave good bottom hardness, and (2) good surface but poor bottom hardness. A covering of 25-30 cm. of snow for nearly 2 months in late winter did not appreciably decrease surface hardness to a depth of 15 cm.

Hardness followed snow temperature closely after a slight time lag. With the comparatively simple methods used, it was possible to produce roads capable of carrying wheeled tractors pulling loads of 350-400 cu. ft. of timber, on gradients $\geq 4\%$. Such roads are suitable for districts in Sweden with a mean snow depth ≥ 40 cm. and a mean January temperature of ≤ -6 to -8°C .

4159. ZEIHNER. Beitrag zur maschinellen Wegunterhaltung mit Hilfe der Schmidt-Anbaugeräte. [Road maintenance with Schmidt attachments.] *Forst- u. Holzw.* 12 (8), 1957 (138-41). [G.]

Describes and illustrates 4 pneumatically operated road-building implements to be attached to the 'Unimog', either in front (bucket) or at the back (grader, etc.), together costing DM.5000, also a strip plough and a hole-digger.

4160. KIESEKAMP. Einsatz von Motorgradern zur Unterhaltung und Instandsetzung von Waldwegen im Gebirge. [The use of motor graders for maintenance and repair of forest roads in mountainous country.] *Forst- u. Holzw.* 12 (11), 1957 (185-9). 5 refs. [G.]

Describes operations in the Harz with the German

Orenstein-Koppel E 540, a 12-ton, 105-h.p. grader (performance data etc. given) on earth, gravel, and metalled roads. Performance was generally very good, cost per m. of road or ditch was $\frac{1}{5} - \frac{1}{17}$ that of manual work. Lack of 4-wheel drive, and a rigid construction, were drawbacks of this model. Organization and planning for large regions is important to avoid costly idle time, and a highly skilled operator is essential.

384. Protective Works, including Torrent Training

See Nos. 3670-3.

385. Drainage, Irrigation, Sedimentation. Water Supply

4161. HUIKARI, O. Skogsdikningen mekaniseras i Finland. [Mechanization of forest drainage in Finland.] *Norsk Skogbr.* 3 (8), 1957 (219-20). [Sw.]

Discusses the costs and efficiency of draining with the Lokomo, Pellonraivaus, and Kajaani ploughs. The first of these is the heaviest and is used by the Forestry Board and the Central Forestry Society. Average costs in 1955 were Marks 33.74/m. compared with 120/m. for hand labour.

4. FOREST INJURIES AND PROTECTION

See also Nos. 3873, 3927.

4162. BÄRNER, J. Bibliographie der Pflanzenschutzliteratur 1950. [Bibliography of plant protection literature for 1950.] Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem. 1956. pp. xli + 438. [G.E.F.]

[Cf. F.A. 17 No. 1691.] Comprises over 13,300 titles.

4163. BÄRNER, J. Bibliographie der Pflanzenschutzliteratur 1946-1947. [Bibliography of plant protection literature for 1946-47.] Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem. 1957. pp. xli + 460. [G.E.F.]

[Cf. F.A. 17 No. 1691.] Comprises > 13,800 titles.

4164. CHAPMAN, G. W. Protection [of Eucalypts]. *Final Rep. World Eucalyptus Conf., Rome 1956*, 1956 (130-7). [E.]

Discusses pests in Australia, pests introduced elsewhere along with Eucalypts, and pests or diseases native to countries planting them; fire, including specific resistance; grazing, including species or strains unpalatable to stock; and research needs.

41. General Technique of Forest Protection. Types of Injury

See also Nos. 4100-1.

4165. KURTH, A., and MAKSYMOW, J. K. Phytosanitärer Beobachtungsdienst und forstlicher Pflanzenschutzdienst. [A phytosanitary observation and protection service for forestry [in Switzerland].] *Kurzmitt. Schweiz. Anst. forstl. Versuchsw.* No. 13, 1957. pp. 8 + 2 sketchmaps, 3 tbls., 4 dgms. [G.]

Discusses the organization and staffing of services

yet to be introduced. From experience of a pilot scheme, the supplementation of part-time observers by full-time specialists, engaged partly on field, partly on laboratory duties, is thought best.

42. Injuries from Inorganic Agencies other than Fire

See also Nos. 4204, 4206.

421. Air Currents

See also No. 4365.

4166. HASENMAIER, E. Die Abhängigkeit der Sturmgefährdung von den Bodenverhältnissen. Beobachtungen in Fichtenreinbeständen der Waldenburger Berge. [Observations on the relation between soils and susceptibility to windthrow in the pure Spruce stands of the 'Waldenburger Berge'. [N. Württemberg.]] *Mitt. Ver. forstl. Standortskart.* No. 4, 1955 (60-1). [G.]

On the 900 ha. of high plateau investigated, sandy sites showed considerably less, and loamy or clayey sites considerably more than the average windthrow area of 9% of the total.

4167. WERNER, F., and ÅRMANN, J. Stormfällningens dynamik—en studie. [A study of the pattern of storm damage.] *Svenska Skogsväsen. Tidskr.* 53 (3), 1955 (311-30). 32 refs. [Sw.]

Field studies on 3 areas damaged by the storm of Jan. 1954 gave the following results, which are compared with those from American and European literature: (1) No clear relationship was found between soil and windthrow. (2) On hilly sites damage was heavy on windward and light on lee

slopes, but the sheltered zone on the latter was succeeded by a badly damaged zone. (3) Stands with heights < 10 m., were undamaged, those of 10–15 m. slightly damaged, and those of > 15 m. severely damaged. (4) Damage was heavier in stands with a level than in those with an undulating canopy. (5) Well- and over-stocked stands were resistant to windthrow. (6) Birch was resistant, and Pine possibly more so than Spruce; coniferous stands with an admixture of Birch were more resistant than pure stands. (7) Damage was worst in stands that had been thinned within the last 10 years. The interpretation of aerial photographs of damage, and measures to reduce damage (conversion, where possible, to uneven-aged stands, severe cleaning and early thinning, before the stand reaches the danger height, inclusion of some Birch, etc.) are discussed.

4168. CARBONNIER, H. Förnyelse av granskogen i Skåne. [Renewing the Spruce forests of Skåne [after the storm damage of January, 1956].] *Svenska Skogsväsen. Tidskr.* 54 (3), 1956 (265–74). 11 refs. [Sw.]

Recommendations include the provision of shelterbelts of deep-rooted trees along exposed edges, and the incorporation of mixtures of e.g. Beech, Birch, Alder, Larch, *Abies alba* and Douglas Fir to reduce risk of damage by wind and root rot and to improve the soil. The need for fencing, nurse crops etc. is discussed.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 3770, 3938, 4238, 4371.

4169. WIDMOYER, F. B. Anatomical aspects of temperature injuries to *Thuja occidentalis* 'nigra'. *Phytomorphology* 6 (3/4), 1956 (235–8). 8 refs. O.B.D.

Anatomical comparisons were made of leaves and stems of *Thuja occidentalis* 'nigra' exposed to extreme temperatures in both a dry and a wet environment, with those injured naturally in the field by temperature changes in the late winter and early spring. The observations showed that freezing often resulted in the rupture and separation of the cell walls, while high temperatures caused atrophy of the epidermal, endodermal and parenchyma cells, accompanied by tannin deposits. The natural injuries were similar to those produced artificially by high temperatures.

4170. SLATER, C. H. W. Frost damage research equipment at East Malling. *Rep. E. Malling Res. Sta.* 1955/56, 1957 (93–6 + 2 photos). 2 refs.

The construction and equipment of frost research rooms in which plants can be subjected to controlled cycles of freezing and thawing are described. Details are given of temperature-recording apparatus, including a special potentiometer for use with thermocouples, and also of a covered shelter for experimental material, and a caravan fitted as a mobile instrument room. *Author's summary.*

4171. POMERLEAU, R., and RAY, R. G. Occurrence and effects of summer frost in a conifer plantation.

Tech. Note For. Br. Can. No. 51, 1957. pp. 15. 8 refs.

In plantations at Valcartier Forest Experiment Station, Quebec Province, average mortality of *Pinus resinosa* at ca. 20 years was 93–95%, apparently due to night frosts in July and August when current year's needles and shoots are still tender. *Pinus strobus* was less susceptible (40–50% mortality). [Cf. F.A. 17 No. 4051.]

4172. IACOVLEV, A. Influența secetei asupra creșterii și texturii lemnului. [The influence of drought on growth and wood quality.] *Rev. Pădurilor* 71 (8), 1956 (501–3). 3 refs. [Rum.]

Tabulates and discusses data showing increment before, during, and after the drought of 1945–6, and % of trees in which wood properties were beneficially or adversely affected by the drought, for (a), dominants, (b) other classes, of *Pinus sylvestris*, *Picea abies*, *Abies alba*, *Quercus robur* and *Q. borealis*.

423. Precipitations

4173. SZÖNYI, L. Vizsgálatok a Mátra sekély talajú köfolyásos bükköseiben. [Investigation of a Beech stand with shallow soil on a slope liable to avalanches.] *Erdész. Kutatás.*, Budapest 1955 (3), (109–27 + smries. in suppl.). 16 refs. [Hu.hu.russ. e.g.]

High soil acidity is increased by the wind removing litter and dusty podzol particles and by water leaching out bases etc. down the slope. A catena, manifested in the stand, develops, and bud coloration in spring differentiates the types, assisting silvicultural work. A group admixture of 30–40% conifers, particularly Norway Spruce and Scots Pine, plus windbreaks and undergrowth, should be established. *From author's summary.*

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 4340, 4366, 4368.

4174. [Investigation of the resistance [of tree species] to inundation, following the 1954 floods in the Yangtze River area.] *For. Sci., Peking* 1 (2), 1955 (156–63). [Chin.]

The study, made in spring 1955, showed that the flood waters reached a peak of 29–73 m. at Hankow and 55–73 m. at Yichang, the inundation lasting up to 140 days in Wu Chang. A table is presented showing for ca. 40 places along the margins of the flood, the condition of ca. 85 hardwood and coniferous tree species, with their age, height, duration of inundation, and its maximum height up each stem. *Salix matsudana*, *S. matsudana* var. *tortuosa*, *S. babylonica*, *Tamarix chinensis*, *Pterocarya stenoptera*, *Fraxinus chinensis*, *Pyrus calleryana*, *Amorpha fruticosa*, *Campsis chinensis*, *Juniperus chinensis* var. *kaizuca* and one other Juniper, were least affected. For comparison the mortality of various tree species inundated in the principal park of Nanking in 1931 is also tabulated. General experience shows that *Pinus thunbergii* withstands flooding very well.

4175. BOLLE-JONES, E. W., and MALLIKARJUNESWARA, V. R. A beneficial effect of cobalt on the

growth of the Rubber plant (*Hevea brasiliensis*). *Nature, Lond.* 179 (4562), 1957 (738-9). 7 refs.

Experiments were made in growing *H. brasiliensis* seedlings in (a) soil with no Co, (b) soil with normal (0.005 p.p.m.) Co content, and (c) soil with high (0.25 p.p.m.) Co content. In general (c) plants showed effects intermediate between (a) and (b); (a) plants were significantly inferior to (b) in height, stem girth and dry weight of root per plant. The absolute Co content of (b) and (c) increased with time, but the rate of increase was much smaller for (a).

43. Forest Fires

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

4176. MACCREADY, P. B., JR. *et al.* **Project Skyfire, cloud and lightning observation handbook.** *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 5, 1955. pp. 47.

Provides a key for identifying different types of cloud, with particular reference to cumulus clouds and their development into thunderstorms. Cloud measurement and surveying techniques are outlined. [Cf. *F.A.* 18 No. 4185.]

4177. GRAHAM, H. E. **Fire whirlwind formation as favored by topography and upper winds.** *Fire Control Notes* 18 (1), 1957 (20-4). 4 refs.

Analysis of conditions in 28 fire whirlwinds in the Pacific north-west leads to the conclusion that the most favourable conditions for their occurrence are over a hot fire near the top of a steep lee slope with strong winds over the ridgetop. [Cf. *F.A.* 15 No. 3689.]

4178. [The effects of conditions of the upper air on fire behaviour.] *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (13-5).

Presents graphs showing, for (a) a high-intensity blow-up [out-of-control] fire and (b) for a fairly intense fire driven by a strong wind, the energy rates in h.p./sq. foot measured or computed for the wind field at various heights, and of the fire, the latter representing the rate at which thermal energy was converted into turbulent energy per foot of fire front for each foot of vertical rise in the convection column.

4179. **A classification of fuels in terms of expected fire behaviour.** *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (12-3).

Suggests that an energy approach would be fruitful, based on (a) combustion period, (b) critical burn-out time, (c) available, and (d) total fuel energy, in which (b) is defined as the maximum time a fuel can burn and still feed its energy into the base of the forward-travelling convection column, and (c) as that fraction of (d) which is so fed.

4180. BYRAM, G. M. **Some principles of combustion and their significance in forest fire behaviour.** *Fire Control Notes* 18 (2), 1957 (47-57).

4181. NAKAMURA, S. [On the flameless combustibility of leaves of trees.] *J. Jap. For. Soc.* 33 (11), 1951 (367-72). 13 refs. [Jap.jap.e.e.]

Results for 44 species, both Japanese and exotic, heated to 500° and 550° C. in a cylindrical electric furnace are tabulated. No correlation could be established between inflammability and the time taken to become inflammable. While *Viburnum odoratissimum*, *Thuopsis dolabrata* and *Myrica rubra* (the last commonly used for firebreaks in Japan), in nearly all cases burnt at 500° without flame, the two former species were slow to burst into flame and the last was one of the quickest. *From author's summary.*

4182. NAKAMURA, S. [Fire resistance tests of leaves of deciduous trees by a cylindrical electric furnace.] *J. Jap. For. Soc.* 38 (4), 1956 (136-7). 4 refs. [Jap.jap.e.e.]

A continuation of previous tests [see preceding abstract], using 30 additional species, both Japanese and exotic. Results are tabulated. In general deciduous broadleaved species proved the most inflammable (7.5-19 sec.), Bamboos most of all, and *Deutzia crenata* and *Hydrangea macrophylla* least (19 sec.), evergreen broadleaved species moderately so (10-28 sec.) and conifers least of all (22-40 sec.).

4183. STOREY, T. G. **A fuel-moisture stick wicket of new design for use at open-type fire danger stations.** *Fire Control Notes* 18 (2), 1957 (58).

432. Prevention and Control

4184. LETOURNEUX, C. **Le problème des feux au Soudan français. [The problem of [forest and bush] fires in French Sudan.]** *Bois For. Trop.* No. 52, 1957 (21-8). [F.]

Describes the types of fire, factors causing them, difficulties of control and prevention, and control measures now being applied.

4185. **Project Skyfire.** *For. Fire Rep. Calif. Div. For.* 1956 [1957] (12-4).

Tests were made of 3 methods of seeding cumulus cloud formations with AgI with a view to reducing lightning strikes: (a) from aeroplanes, (b) from ground generators and (c) from small helium-filled balloons. A limited test of (a) gave promising results, no definite results were obtained from (b), and results from (c) are unknown. Tests are to continue. [Cf. *F.A.* 17 p. 614; 18 No. 4176.]

4186. WRIGHT, W. F. **Aerial fire fighting trials show promising results.** *N.Z. Timb. J.* 3 (8), 1957 (30-3).

Reports on trials made in 1955-56 at Rongotai and Rotorua of discharging water from the air for the suppression of scrub, tussock and slash fires.

4187. MILLER, H. R., and WILSON, C. C. **A chemical fire retardant... results of field trials using sodium calcium borate on forest fires in 1956.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 15, 1957. pp. 20. 2 refs.

[Cf. *F.A.* 17 No. 4066.] Field tests showed that sodium calcium borate solution is more effective than water alone, the amount needed to control and extinguish a fire being $\frac{1}{3}$ that of water. It is equally effective on light and heavy fuels, and a surface crust of dry powder formed after evaporation prevents the

fire rekindling. It controlled fires particularly rapidly when dropped from the air. Details of use in ground and aerial operations for 1956 are given. Experiments in mixing and storing are described. Data from laboratory mixing tests are given in an appendix.

435. Benefits of Fire Control. Injurious Effects of Fire

See also No. 4191.

4188. CHAPMAN, H. H. Forty-year effect of a summer fire on 4-year-old Longleaf Pine at Uria, Louisiana. *J. For.* 55 (4), 1957 (301-2).

A large number of 4-year Pine seedlings were destroyed by a bad fire in summer 1917, and a second summer fire in 1924 killed many of the survivors. Measurements made at intervals on two permanent 1-acre plots showed that b.a. (Pines and hardwoods) increased from (a) 35.84 sq. ft. and (b) 9.16 sq. ft. in 1932 to (a) 146.42 sq. ft. (ca. full stocking) and (b) 105.70 sq. ft. in 1955. Controlled burns were done at 3-year intervals to prevent accidental fires. The plots now need thinning.

4189. Forest fire losses in Canada, 1955. Forestry Branch, Department of Northern Affairs and National Resources, Ottawa. 1956. pp. 12 + 6 tbls.

4190. National forest fire report: calendar year 1955. U.S. Forest Service, Washington, D.C. [n.d.] pp. 16.

Consists of 6 tables: (1) number of fires, by causes, (2) area burned, by causes, (3) area burned, by size classes, (4) damage, by causes, in dollars, (5) area burned and damage, and (6) number of fires, by size classes and causes.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 3666, 3891, 3893, 3896, 3937, 4088.

4191. BRUCE, D., and NELSON, R. M. Use and effects of fire in southern forests: abstracts of publications by the Southern and Southeastern Forest Experiment Stations, 1921-55. *Fire Control Notes* 18 (2), 1957 (67-96). 195 refs.

4192. Prescribed summer fire in the control of lowland hardwoods. *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (71).

At the Santee Experimental Forest, near Charleston, S.C., in 40- to 50-year Loblolly Pine stands, only 31% of the hardwood rootstocks remained alive after 5 years' successive prescribed summer burning; 95% of Myrtle and 79% of Sweetgum were killed. Black Gum and Oaks proved hardiest.

4193. [Fire control plots in savanna forest.] *Rep. For. Res. Nigeria 1954/55*, 1957 (8-9).

Preliminary observations on 15-year-old plots indicate that there are no outstanding differences to be seen between full protection, annual early burning, and early burning every 2 or 4 years. Although unburnt plots carry a heavy growth of matted grass, there is no obvious humus. All plots

have the continuous algal layer on the soil surface that is common to almost all undisturbed savanna soils.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 3968, 3977-9, 4272.

4194. Numéro spécial sur les produits débroussaillants et dévitalisants. [Special number on chemical control of trees and shrubs.] *Rev. for. franç.* 9 (6), 1957 (437-89). [F.]

Includes general articles by A. Oudin and P. Arbonnier; the use of chemical weedkillers (growth regulators) to kill Hornbeam coppice (A. Normand); control of broadleaved species by Ammate (P. Arbonnier); tests of a new weedkiller, Tormona (80% 2,4,5-T and 20% 2,4-D) on coppice regrowth (M. Cointat); the use of weedkillers in the landes of Gascony (J. Guinaudeau); the use of weedkillers in the eastern Pyrenees (A. Michel); and the use of weedkillers to improve Alpine pastures (M. Bouverot).

4195. PARHAM, J. W., MUNE, T. L., and O'CONNOR, B. A. *Lantana* [*L. aculeata*] and its control in Fiji. *Agricultural Journal, Fiji* 27 (1/2), 1956 (28-32). 3 refs. O.R.E.

A brief review of progress in the experimental control of this proclaimed noxious weed. (1) Biological methods, with flies, moths and beetles, have not so far achieved much success; the most promising are cerambycid beetles (adults destroying young shoots, larvae boring in branches and stems). (2) Direct methods: (a) periodic cutting back has proved useless; (b) systematic uprooting, followed by planting up with economic crops (including grasses), succeeds provided that any foci missed are subsequently uprooted, but the initial uprooting alone (by hand) costs ca. £20/acre; (c) chemical sprays, provided they are repeated, have proved the most economic proposition. Established *Lantana* must first be cut back and the regrowth treated when 2-3 ft. high. Effective treatments are: MCPA (3 lb. acid equivalent/100 gal. water/acre); amine salts of 2,4-D (4 lb./acre); esters of 2,4-D or 2,4,5-T (3.6 lb. acid equivalent/acre). Costs, including labour, chemicals, two sprayings and grassing, < £12/acre. [Cf. F.A. 16 No. 1878; 18 No. 566.]

4196. DERSCHIED, L. A., and FERRELL, E. K. Chemical control of woody plants. *Circular, S. Dakota Agricultural Experiment Station, Brookings* No. 114, 1955. pp. 12. From *abstr. in Weed Abstr.* 6 (3), 1957 (174). O.R.E.

Recommendations are made for foliage spraying, basal spraying, cut-surface applications and stump treatments, using 2,4-D, 2,4,5-T and NH_4 sulphamate. Control methods are described for some common woody plants including (in detail) species of *Rhamnus*, *Cornus*, *Juniperus*, *Quercus*, *Artemisia*, *Rhus*, *Salix*, *Rosa* and *Prunus americana*. A further list gives brief recommendations (type of application, season for treatment, chemical, rate, carrier) for ca. 30 other species.

4197. KÜTHE, K. Weitere Erfahrungen bei der Bekämpfung von Ginster auf Weiden. [Further results on Broom control on pastures.] *Gesunde Pflanze, Frankfurt-am-Main* 7, 1955 (257-9, 273-4). 4 refs. [G.] From abstr. in *Weed Abstr.* 6 (3), 1957 (168). O.R.E.

Reports the completely successful control of Broom [*Cytisus scoparius*] by growth regulators (2-5 kg./ha.) applied at low volumes (50-75 litres/ha.) by a fruit-tree sprayer. Any seedlings appearing in subsequent years should be mown off.

4198. Pellets may ease *Ribes* control work. *Rep. Calif. For. Range Exp. Sta.* 1956 [1957] (42).

Seedlings and coppice shoots of Sierra Nevada Gooseberry were killed by scattering clay pellets impregnated with 2,4-D on to the soil round the base of the plants.

4199. Eyebrows rose in 1947. *Service, New Plymouth* 1 (2), 1956 (4-5). O.R.E.

A short report on a large-scale undertaking begun in 1947 by the South Canterbury Catchment Board to eradicate Willows, Gorse, Broom and lupin infesting the main South Canterbury waterways. In treating Willow the following frilling operations have become standardized, using volumes of weedkiller based on the square of the diameters of the trees: (1) trees 6-18 in. in diam., 10% 2,4-D (ester) at $\frac{1}{2}$ pint per 12-in.-diam. tree, (2) trees 18 in.-4 ft. in diam., 2,4-D (ester; 3.5 lb. acid equivalent/gal.), using $\frac{1}{2}$ pint per 3-ft.-diam. tree, and (3) trees > 4 ft. in diam. 2,4-D (ester; 4 lb. acid equivalent/gal.) at $\frac{1}{2}$ pint per 3 ft.-diam.-tree, on two frills, or using double strength on a single frill.

4200. CARDER, A. C. The use of dalapon to control couch and brome grass around trees and shrubs. *Res. Rep. West. Sect. nat. Weed Comm. Can.* 1956 (7). O.R.E.

A solution consisting of 1 oz. dalapon to 1 gal. water was applied to the foliage of couch and brome grass growing under and close to the boles of Lilac, Larch, Apple, Oak, Saskatoon, Rose, Caragana, Poplar, Currant, Birdcherry, Aspen and Virginia Creeper. The solution was knapsack-sprayed until the grass was thoroughly wet, on 30 May and again on 11 July. By mid-September good top-growth kill of the grass was evident, while the foliage of the woody species (except Birdcherry, Oak and Larch) was largely uninjured.

4201. FRIESEN, G., and CAMPBELL, J. The control of couch grass in field shelterbelts. *Res. Rep. West. Sect. nat. Weed Comm. Can.* 1956 (7). O.R.E.

Dalapon at the rate of (1) 27, (2) 54 and (3) 81 lb./acre was sprayed in late June 1956 on couch grass in a 3-year-old shelterbelt consisting of Elm, Ash and Caragana in Manitoba: (1) gave partial control of couch grass and did not damage the trees; (2) gave satisfactory control of couch grass but Ash and Elm showed signs of damage; (3) resulted in complete kill of couch grass and caused serious damage to Ash and Elm, but had no visible effect on Caragana.

4202. Research on the efficacy of chemical weed-killers. *Rep. Dep. For. S. Afr.* 1954/1955, 1956 (18).

Tests of the effect of spraying *Gleichenia poly-podioides* with different concentrations of the butoxy ethanol esters of 2,4-D and 2,4,5-T in various concentrations showed that water was as effective a solvent, but not as rapid in action, as dieselene. Stronger concentrations usually had a more immediate and lasting effect than weaker, but best results were obtained by a double application of a weak (1 : 100) solution in water, which confirms the importance of thorough wetting of the plant. The cost of the chemicals, the expense of application, and the difficulty of disposing of the thick mat of dead fern, make the treatment unsuitable for use on a large scale.

4203. WEERARATNA, W. G. Control of Kekilla [*Gleichenia linearis*] in the wet low country with Tembusu (*Fagraea fragrans*). *Ceylon For. (n.s.)* 2 (4), 1956 (190-1). 3 refs.

An experimental planting of *F. fragrans* was made in 1949 to test its capacity to grow on degraded *G. linearis* land (repeatedly burnt and with a thick mat of fern). Two-hundred 6-month seedlings (grown from Malayan seed), mean height 10-11 in., were planted [? on cleared patches] at 10 × 10 ft. spacing, and weeded once in the first year. Survival was 97%, and by 1956 mean height was 37 ft. 6 in. and mean g.b.h. 23.7 in. Two light thinnings have been given, and there is now no trace of fern on the plot, though it abounds on neighbouring areas in impenetrable thickets. A feature of *F. fragrans* is its ability to produce branches low down on the stem (from about 2 ft. from the ground) and to retain them even when grown at close spacing. Lateral branches have a wide spread and numerous thick, dark-green leaves, casting a dense shade on the ground which may be the chief factor in suppressing the fern. Some notes are given on vegetative propagation of this species.

443. Fungi and Bacteria

See also Nos. 3728-9, 4279, 4373.

4204. PEACE, T. R. Approach and perspective in forest pathology. *Forestry* 30 (1), 1957 (47-56). 11 refs.

The author reviews briefly the lines along which forest pathology has developed from its emergence as a separate science up to the point now reached, where the influence of environment on the tree is too generally regarded as of greater importance than the actual pathogen attacking it. He would correct a major assumption, made by this school of thought, that the 'natural' forest necessarily provides the ideal environment, and that therefore any departure from nature, e.g. the use of pure stands or the planting of exotics is bound to encourage disease. He considers that forest diseases are mostly complexes, in each of which site and pathogen play very variable rôles of differing importance. Any attempts at this stage to draw broad conclusions covering a large number of diseases are certain to lead to error. He suggests that, as producers of trees on a limited range of sites, and not as preservers of nature, we must avoid behaving as though 'unnatural' were the same thing as 'unhealthy'. *Author's summary.*

4205. GAGNOTTO, A. V. Le malattie delle piante ornamentali osservate in Italia. Parte 1. Pteridophyta e Gymnospermae. [The diseases of ornamental plants recorded in Italy. Part 1. Pteridophytes and Gymnosperms.] *Ann. Sper. agr. (n.s.)* 11 (2), 1957 (i-xliv). Many refs. [It.] C.G.B.

A review of literature, listing bacteria and fungi and also covering disorders of unknown origin.

4206. FABRICATORE, J. A. Le malattie delle piante ornamentali osservate in Italia. Dicotyledonae. Parte prima. [The diseases of ornamental plants recorded in Italy. Dicotyledons. Part I.] *Ann. Sper. agr. (n.s.)* 11 (2), 1957 (xlv-lxxviii). 54 refs. [It.] C.G.B.

Lists diseases or disorders caused by bacteria, fungi, viruses, nematodes, and environmental conditions, on plants of the families Acanthaceae to Caryophyllaceae (in alphabetical order).

4207. MORWOOD, R. B. A preliminary list of plant diseases in Fiji. *Agricultural Journal, Fiji* 27 (1/2), 1956 (51-4). 24 refs. O.R.E.

Includes *Botryodiplodia theobromae* on Mahogany and *Corticium salmonicola* on *Lantana aculeata*.

Fungi and Bacteria: Chemical Control

See Nos. 4208-13, 4239, 4259-60, 4262.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 3937, 3993, 4835.

4208. ČERNOHLÁVEK, V. Výsledky použití hypermanganu proti houbovým chorobám. [Results of using KMnO_4 against fungal diseases.] *Lesn. Práce* 35 (6), 1956 (285-6). [Cz.]

Spraying of Beech and Spruce seedlings in nurseries with a 0.15-0.2% solution of KMnO_4 at the rate of 3-4 litres/sq.m. completely checked damping-off, while soaking Spruce seed in the same solution for 1 hour before sowing reduced damping-off to a minimum.

4209. VONDROUŠ, M. Hypermanganem proti padání semenáčků. [KMnO_4 as a remedy against the damping-off of seedlings.] *Lesn. Práce* 35 (9), 1956 (426-7). [Cz.]

The author states that two applications of a 0.0083% solution of KMnO_4 (with a 2-day interval) at the rate of 0.5 litre/sq.m. were sufficient to stop the damping-off of *Tilia* sp. seedlings.

4210. VANĚK, J. O použití Agronalu a Kuprikolu jako prostředku proti padání semenáčků. [The use of Agronal and Kuprikol to control the damping-off of seedlings.] *Lesn. Práce* 35 (5), 1956 (230-1). [Cz.]

Results of tests showed that: (1) Agronal did not impair the germinative capacity of Scots Pine seeds and acorns soaked in it, but it encouraged rather than checked damping-off; (2) spraying Pine seedlings with 0.75% Kuprikol solution afforded protection against damping-off, and gave increased survival, height and root growth.

4211. CAROSELLI, N. E. Juniper blight and

progress on its control. *Plant Dis. Repr.* 41 (3), 1957 (216-8). A.P.B.

Commercial fungicides were tested in two consecutive years for control of *Phomopsis juniperovora* on 1- and 2-year-old Junipers in Rhode Island nurseries. The best and most consistent results were given by Kromad (Mallinckrodt Chemical Co.) 2 oz. and 4 oz. in 10 gal. water, Merbam (Chipman Chemical Co.), 1 oz./10 gal. water, and WK-34 (Upjohn Co.), 1.2 oz./10 gal. water.

4212. CRAM, W. H., and VAARTAJA, O. Rate and timing of fungicidal treatments. *Phytopathology* 47 (3), 1957 (169-73). 20 refs.

Gives details of germination and seedling condition when *Picea pungens*, *Pinus sylvestris*, and *Caragana arborescens* (2 progenies each) were sown in flats of nursery soil inoculated with virulent *Rhizoctonia solani* and drenched at rates of 0.1, 0.5, 2.5, and 10 g./sq. ft. with Orthocide 75 (75% captan) or Tersan (75% thiram). Damping off was largely controlled by the weekly application of the lowest rate of either fungicide, certain species doing better with the 0.5 rate but mortality generally increased from this rate up, because of phytotoxicity and soil crusting. Very good control without phytotoxicity was obtained with a first application of 0.6 g./sq. ft. of Tersan and subsequent applications of 0.1, weekly or bi-weekly.

4213. VAARTAJA, O. Damping-off control by antibiotic plant substances. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (2), 1957 (2).

Preliminary tests were made of the effect of various powdered materials of plant origin in controlling *Rhizoctonia solani* in pot cultures of *Pinus banksiana*. The material was added at concentrations of 1, 5, 20, and 50% to cultures of the pathogen, and seeds were sown in the mixture; controls were sown in vermiculite and vermiculite + Orthocide 75 (75% captan). The materials tested were: (1) leaves (*Pinus banksiana*, *Picea glauca*, *Abies balsamea*, *Populus tremuloides*, *Betula papyrifera*, *Ulmus americana*, *Acer negundo*); (2) bark (*P. glauca*, *A. balsamea*, *P. tremuloides*); (3) humus and litter from forest stands (*P. banksiana*, *P. glauca*, *P. tremuloides*); (4) *Sphagnum* (fresh and dried); (5) lichen (*Cladonia alpestris*). The results (tabulated) indicate that materials of groups (1), (2) and (5) contain fungicidal substances; (3) had no effect and (4) very little. All materials of (1) and (2) gave some or good control, especially with the concentration of 20%. Some materials inhibited germination at higher concentrations, but Spruce bark seemed to stimulate it. The control afforded by the different substances was not correlated with differences in pH. Water extracts from some materials were tested and gave distinctly poorer results, which suggested that the antibiotics are either not readily soluble in water or are rapidly decomposed in solution.

4214. VAARTAJA, O. The susceptibility of seedlings of various tree species to *Phytophthora cactorum*. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (2), 1957 (2).

Experiments showed that *P. cactorum* is potentially pathogenic to seedlings of a number of tree species.

Thuja plicata, and possibly *Larix laricina*, are less susceptible than most other species. The disease developed faster on seedlings grown under a low light intensity.

4215. TERASHITA, T., and ITO, K. [Some notes on *Cylindrocladium scoparium* in Japan.] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 87, 1956 (33-47 + 10 photos). 15 refs. [Jap.jap.e.e.]

Covers symptoms, morphology, parasitology, and physiology, including the effects of fungicides. Chief damage has been to lupins and *Eucalyptus globulus*, but greenhouse inoculations (not supported by re-isolation) were successful on Robinia, Black Wattle, and *Albizia* sp., 13 Eucalypts and *Larix leptolepis*, to name only the trees of the 28 species (5 families) listed.

4216. UROŠEVIČ, B. Výskyt černé hniloby žaludů v Československu. [Appearance of the black rot of acorns in Czechoslovakia.] *Lesn. Práce* 35 (9), 1956 (420-6). [Cz.]

Ophiostoma attack was found both on acorns imported from Yugoslavia (2-7%) and on those of Czech origin (1-3%). Results of examination of the latter and measurements of perithecia found on the acorns, are tabulated.

443.3. Diseases of Older Stages

4217. BAZZIGHER, G. Pilzkrankheiten in Aufzuchtungen. [Fungus diseases in young plantations.] *Kurzmit. schweiz. Anst. forstl. Versuchsw.* No. 12, 1956. pp. 3 + 2 photos, 1 gph. 6 refs. [G.g.]

Describes and discusses the chief pathogenic fungi endangering young conifer plantations in the alpine regions, including *Herpotrichia nigra*, *Botrytis cinerea*, *Cucurbitaria piceae* on Spruce buds; various rusts, particularly *Phacidium pinicembrae*, a little known fungus causing needle-cast on snow-covered branches of *Pinus cembra*, which has recently caused severe injuries and many losses near Avers-Cresta (Upper Engadine). The temperature requirements of the fungus in the laboratory resemble those of *H. nigra*, with a range from 0 to ca. 30°, and an optimum of 15° C.

4218. JACQUIOT, C. Observations sur les relations entre la flore des champignons lignicoles et les traitements forestiers en forêt de Fontainebleau. [Observations on relationships between the fungus flora of trees and silvicultural measures in the Fontainebleau forest.] *Repr. from Travaux des Naturalistes de la Vallée du Loing* No. 12, 1955. pp. 7. [F.f.]

The author found that quantitative and qualitative changes in the fungal flora induced by silvicultural measures were very much what would be expected *a priori*. The main results are: change of microclimate under the canopy, progressive elimination of dead and dying trees, extraction of all large trees in regeneration fellings or thinnings, injuries to the standing crop by felling and extraction, and formation of new fungus substrates on, for example, felled stems. Their combined effects are: (1) diminution of the number of species of tree fungi, and (2) changes in the quantitative distribution (frequency) of the remaining fungi.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 3718, 3993, 4043, 4371, 4570.

4219. REDMOND, D. R. Infection courts in butt-rotting fungi in Balsam Fir. *For. Sci.* 3 (1), 1957 (15-21). 9 refs.

This study is complementary to that already referenced [see *F.A.* 18 No. 1873] on top-killing by budworm. Root systems of 18 trees aged 65-125 were exposed. Decay arose most commonly from unavoidable wounds in forks and stone bruises, and in none of the 3% of the cases that were referred to budworm attack (checked by age or whorled root-regeneration) was decay entirely related to defoliation. Butt rot incidence is very high after 65, and because of it, windthrow after 75 years. The shortest rotation producing merchantable timber is indicated.

4220. [Root and butt rot of Balsam Fir following defoliation by budworm.] *Rep. N. Brunsw. Dep. Lds. Min.* 1955/56, 1956 (110-2).

Stem analyses of Balsam Fir that survived the Spruce budworm outbreak of 1914-20 show that many of them suffered considerable top-killing. A considerable % of these trees contain varying amounts of heart-rot caused by *Stereum sanguinolentum*. Infection is often associated with the presence of leaders killed back to a diameter of $> \frac{1}{2}$ in. Analyses of excavated root systems revealed a high mortality of rootlets, associated with prolonged and severe defoliation by the budworm. Death of larger rootlets provides entrance courts for rot fungi that eventually reach the merchantable portions of surviving trees. Investigations of the effects of defoliation on rootlet conditions are to be continued.

4221. SMERLIS, E. *Hylobius* injuries as infection courts of root and butt rots in immature Balsam Fir stands. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (2), 1957 (1).

Examination of the root systems of 1926 living trees indicated that a proportion (in 52-year-old stands as high as 60%) of root- and butt-rotting fungi enter through injuries caused by *Hylobius* spp.

4222. OSTRANDER, M. D., and FOSTER, C. H. Weevil/red rot associations in Eastern White Pine. *For. Res. Note Ntheast. For. Exp. Sta.* No. 68, 1957. pp. 2.

In a vigorous unpruned Pine stand in the Pack Forest, N.Y., examination of 97 trees showed that infections of *Fomes pini* were $2\frac{1}{2}$ times more frequent on trees with > 5 attacks of *Pissodes strobi* than on trees with fewer insect attacks, and 80% of all red-rot infections were associated with weevil injury.

4223. NORDIN, V. J., and CARMICHAEL, E. J. Red stain in Lodgepole Pine. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (1), 1957 (3).

Red stain or incipient decay in Lodgepole Pine has generally been attributed mainly to *Fomes pini*, but investigation of pole-stage stands in Alberta has shown that 72-87% of red stain is caused by *Stereum pini*, about which and its effects very little is known. [Cf. *F.A.* 14 No. 434; 15 No. 3734; 18 No. 1796.]

4224. GIBSON, I. A. S. *Armillaria* root rot. *Rep. For. Dep. Kenya* 1954/55, 1957 (20).

A field survey of the incidence of *Armillaria mellea* in Kenya Pine plantations has been completed. Losses on the whole are low, but the available data show that *Pinus canariensis* is the most and *P. halepensis* the least susceptible, with *P. patula* and *P. radiata* intermediate. Very little infection was found in plantations established on grassland sites, while sites formerly carrying Bamboo, indigenous forest, or previous plantations, were often infested to some extent. No difference in susceptibility was observed between plantations of different ages (2–12 years).

4225. RISHBETH, J. Some further observations on *Fomes annosus* Fr. *Forestry* 30 (1), 1957 (69–89). 7 refs.

[Cf. F.A. 13 No. 3095.] In a wide range of British forests, *Fomes annosus* attacks originate from stump infection following thinning, and under suitable conditions a relation can be found, by sampling, between the number of trees killed and the proportion of stumps earlier infected. In East Anglia very dry weather apparently favours stump infection, which otherwise often reaches a maximum in late winter. There is a general tendency for stump infection to increase. In Thetford Chase, attacks on many acid soils have become stabilized, whereas those on some alkaline soils are still progressing. Recent estimates of economic loss through killing and butt-rot are compared. Experiments show that stump treatment gives excellent protection against killing, and the present large-scale creosoting of stumps in East Anglia is also effective. An outline is given of recent research on stump treatments. *Author's summary.*

4226. *Fomes annosus*: a fungus causing butt rot and death of conifers. *Leaflet For. Comm., Lond.* No. 5 (rev.) 1957. pp. 10. Price 8d.

4227. RENNERFELT, E. Untersuchungen über die Wurzelfäule auf Fichte und Kiefer in Schweden. [Root rot of Spruce and Pine in Sweden.] *Phytopath. Z.* 28 (3), 1956 (259–74). 13 refs. [G.g.e.] O.R.S.

Discusses the distribution of *Fomes annosus*, its economic importance, the spread of infection, methods of control, and the planting of resistant species.

4228. MOLIN, N. Om *Fomes annosus* spridningsbiologi. [The infection biology of *F. annosus*.] *Medd. SkogsforsknInst., Stockh.* 47 (3), 1957. pp. 36. 45 refs. [Sw.e.] Price Kr.2.

Deals with laboratory and field studies. Seven out of 10 young diseased Pines, examined 10 years after planting in an area previously carrying infected Spruce, had roots touching root-systems of infected Spruce stumps. In laboratory tests, basidiospores of *F. annosus* readily passed through layers of soil and sand 20–40 cm. thick and germinated on wood underneath. An examination, after some months, of stumps of trees sound at the time of thinning, showed that infection, attributed to aerial infection since thinning, was present in the upper part of 11% of Spruce and 5–6% of Pine stumps. In Spruce the incidence of infection increased with the severity of

thinning. No significant difference was found between the variety of species of dominant microflora isolated from soil of healthy and infected stands. *F. annosus* and other fungi failed to grow in laboratory tests on nearly all untreated soils from 14 sites, but grew readily on many of the soils after heat sterilization. The inhibiting agents appear to be of biological origin, unstable in water solution, and most stable at pH 5–5.5.

4229. NAGATOMO, I., and AKAI, S. [Studies on wood decay. X. On *Gloeoporus dichrous* (Fr.) Bres. causing white rot of wood of living Cherry trees.] *Acta Phytotaxonomica et Geobotanica, Kyoto* 15 (2), 1953 (48–55). 22 refs. [Jap.e.e.] L.S.

Presents information on the morphology, physiology and range of the fungus. Near Kyoto it has been collected from *Prunus yedoensis*, *Quercus acutissima*, *Salix babylonica* and *Prunus* sp.; the first 3 species are new host records. Optimum temperature for mycelium development is ca. 28–30° C. In tests of the resistance to infection of 7 broadleaved and 4 coniferous species, *Kalopanax ricinifolius* was the least and *Cryptomeria japonica* the most resistant. *From authors' summary.*

4230. PESANTE, A. Osservazioni su una carie del platano. [A rot of *Platanus occidentalis*.] *Ann. Sper. agr. (n.s.)* 11 (2), 1957 (ccxlix–cclxvi). 11 refs. [It.it.e.] C.G.B.

The localization, and some biochemical characteristics, of a red pigment in the sound wood, and the macro- and microscopic characters of the decayed wood, of a Plane tree suffering from heart-rot, are described. A description is given of two fungi isolated from the decayed wood—*Haplaria ochracea* sp. nov. the causal agent of the decay, and *Scytalidium lignicolum* gen. et sp. nov.

4231. WRIGHT, J. E., and IACONIS, C. L. Estudios sobre Basidiomycetes. III. *Polyporus rickii* f. sp. *negundinis* sobre arces vivos. [Studies on Basidiomycetes. III. *P. rickii* f. sp. *negundinis* on living Maples.] *Revista de Investigaciones Agrícolas, Buenos Aires* 9 (2), 1955 (97–109 + 1 plate). 23 refs. [Span.span.] A.P.B.

A pathogen causing canker on ornamental trees of *Acer negundo* in the streets of Buenos Aires is described and identified as a new form of *P. rickii*.

4232. TOOLE, E. R. Heartrot in bottomland Red Oaks two years after inoculation. *Plant Dis. Repr.* 40 (9), 1956 (823–6). A.P.B.

Of 150 trees (*Quercus phellos* and *Q. nuttallii*) 50 were inoculated with *Fomes geotropus* (a), 50 with *Polyporus fissilis* (b) and 50 with *P. hispidus* (c). One year after inoculation (a) and (c) had spread ca. 1.5 in. above and below the point of inoculation in the heartwood; (b) had spread up ca. 2.5 in. and down ca. 2.6 in. from the inoculation hole. After two years 24 trees were felled, 18 of which had become infected: (a) had spread up ca. 7.9 in., and down ca. 8.1 in.; (b) both up and down ca. 7.2 in.; and (c) up ca. 9.0 and down ca. 8.6 in. Horizontal spread of infection varied from almost nil to 6 in. on either side of the inoculation hole.

4233. IGMÁNDY, Z. Csersarjerdök töközhadást okozó gombái. [Fungi causing butt rot in *Quercus cerris* coppice.] *Erdőmérnöki Főiskola Közleményei, Sopron* 1955 (131-47). 16 refs. [Hu.russ.g.]

Data are given to show the importance of butt rot. The chief pathogens are *Xanthochrous obliquus* [*Poria obliqua*] and *X. [Polyporus] cuticularis*, the mode of attack and incidence of which are described. They are difficult to distinguish macroscopically, but the indications are that the former plays the decisive rôle. *Leptoporus [Polyporus] irpex* is associated with these two fungi in lesions due to browsing at the root collar. Data on the volume of cull due to these fungi are given for a 46-year stand. The rot spreads across as well as up the stem and, though research has shown no positive proof, it is assumed that false heart is caused by it.

4234. HARACSI, L., and IGMÁNDY, Z. A csertapló (*Xanthochrous obliquus* (Pers.) B. et G.) előfordulása lombfáinkon. [The occurrence of *X. obliquus* on broadleaved species in Hungary.] *Erdőmérnöki Főiskola Közleményei, Sopron* 1956 (1), (73-87). 9 refs. [Hu.hu.russ.g.]

Deals with the taxonomy, parasitism, and various forms of *X. obliquus* [*Poria obliqua*] to which *X. nidus-picis* is relegated. Its morphology (sexual and so-called asexual forms) varies greatly with the hosts, *Acer platanoides*, *Aesculus hippocastanum*, *Betula verrucosa*, *Fagus sylvatica*, *Juglans regia*, *Platanus acerifolia*, *Populus alba*, *P. tremula*, *Quercus cerris*, *Q. robur*, and *Q. sessiliflora*. Attacks on each of these are illustrated by photographs. Other hosts will no doubt be discovered. The damage done to *Q. cerris* is considerable and widespread.

4235. ROTH, L. F., TRIONE, E. J., and RUHMANN, W. H. *Phytophthora* induced root rot of native Port-Orford Cedar. *J. For.* 55 (4), 1957 (294-8). 8 refs.

A fuller account of the article noticed in *F.A.* 18 No. 1802.

4236. TRIONE, E. J., and ROTH, L. F. Aerial infection of *Chamaecyparis by Phytophthora lateralis*. *Plant Dis. Repr.* 41 (3), 1957 (211-5). 7 refs. A.P.B.

Root rot of *C. lawsoniana* caused by *P. lateralis* has greatly increased in recent years along the southwest coast of Oregon. In the summer of 1954 and in subsequent seasons aerial infections caused by *P. lateralis* have been found on foliage, branches and main stems. Aerial infections result from detached sporangia and probably also from zoospores carried to the foliage by moisture-laden air or splashing rain. Conditions are favourable for foliage infection during winter and most of the autumn, but not in the mild, dry summer. *From authors' summary.*

4237. FERNANDES, C. TAVEIRA. A noqueira também pode ser parasitada pela *Phytophthora cinnamomi* Rands. [Walnuts also may be attacked by *P. cinnamomi*.] *Publ. Serv. flor. aqúic. Portugal* 21 (1), 1954 (19-31 + 6 plates). 11 refs. [Port.e.]

A pathogen isolated from diseased Walnuts in Portugal was very similar to *P. cinnamomi*, and

experimental inoculations of Chestnut trees confirmed this similarity. Control measures are recommended on the lines of those used for ink disease of Chestnut.

Wilts, Diebacks etc.

See also Nos. 3725, 4374-5.

4238. GEORGESCU, C. C., and MOCANU, V. V. Un atac de *Diplodia pinea* (Desm.) Kickx. pe lujeri și ace de pini vătămați de înghețuri tirzii. [An attack of *D. pinea* on shoots and needles of *Pinus sylvestris* injured by late frosts.] *Rev. Pădurilor* 71 (6), 1956 (383-6). [Rum.]

Describes in detail the development of *D. pinea* on 3-year-old plants of *P. sylvestris* injured by severe frosts on 17-24 April followed by snow on 23 May.

4239. POTTER, H. S. The use of chemicals to suppress symptoms of Dutch Elm disease in two-year-old American Elm trees inoculated with *Ceratomyces ulmi* (Schwarz) Buisman. *Abstr. of thesis, in Dissert. Abstr.* 16 (12), 1956 (2292). O.R.S.

The effect of various chemicals in preventing growth of the pathogen in culture and suppressing symptoms in young trees was tested. Puritized Agricultural Spray [P.A.S.] (a formulation of phenyl mercuric triethanol ammonium lactate) and OQB (8-hydroxy-quinoline benzoate) at low concentrations, 1 and 20 p.p.m. respectively, and HD-109 and HD-160 (the K and Na salts of 2-carboxymethyl-mercaptobenzothiazole) only at higher concentrations (500-1000 p.p.m.), prevented growth of the pathogen in culture, while Nabam, Vancide 51 (a formulation of the Na salt of dimethyl-dithiocarbamic acid and that of 2-carboxymethyl-mercaptobenzothiazole) and an experimental compound AC-12046 (Na 4,5-dimethyl-2-thiazolyl-mercaptacetate) were intermediate; agrimycin, terramycin, chloromycin and achromycin at 10-200 p.p.m. inhibited but did not prevent growth, and streptomycin and actidione were ineffective at these concentrations. Phytotoxicity to 10-week Elm seedlings was determined by applying the chemicals to the roots in nutrient solution and (the antibiotics only) to the leaves as sprays. P.A.S. and actidione were the most toxic; OQB and the other antibiotics were toxic only at high concentrations. HD-109 and HD-160 produced formative effects in young foliage and roots at 20 p.p.m. and over, and actidione at 10-20 p.p.m. caused foliage malformation. Keeping young trees in complete darkness or alternating dark and light before inoculation, had no significant effect on symptoms. One-year trees were less susceptible to inoculation than 2- or 3-year trees. The effect of the chemicals was tested by applying them in nutrient solution to the roots of 2-year trees in gravel in a greenhouse, and severity of infection was evaluated from wilting and vascular discoloration. HD-109 (10 p.p.m.), HD-160 (10 p.p.m.), P.A.S. (5 p.p.m.) and Vancide 51 (20 p.p.m.) effectively suppressed development of symptoms; OQB (250 p.p.m.) was only temporarily effective; and AC-12046 (40 p.p.m.) and Nabam (40 p.p.m.) were extremely toxic. None of the antibiotics was effective when applied as a spray in the nursery.

C. ulmi was re-isolated from discoloured, but not from normal coloured, wood regardless of treatment. Results indicate that with proper control young trees may be used successfully to test possible chemotherapeutants.

4240. BOYCE, J. S., JR. Sampling [for detection of] Oak wilt trees with an increment hammer. *Plant. Dis. Repr.* 40 (9), 1956 (822). 2 refs. A.P.B.

Trees were sampled at 3 points round the circumference. Small squares of bark were removed and the exposed wood swabbed with 95% alcohol and flamed. Two increment cores were then removed from each area with an increment hammer. The cutting tube of the increment hammer was dipped in alcohol and flamed immediately before sampling.

4241. BART, G. J. Host-parasite relationships of the Oak wilt fungus. *Abstr. of thesis, in Dissert. Abstr.* 16 (11), 1956 (2008-9). O.R.S.

Of 17 species of trees, inoculated with the fungus at 3-5 years old, Aspen, Blue Beech [*Carpinus caroliniana*], Elm, Locust, Maple and Walnut were found to be immune, Ash, Beech and Sourwood [*Oxydendrum arboreum*] resistant, Dogwood, Hickory, Hop-Hornbeam [*Ostrya* sp.], Sassafras and Wild Cherry slightly susceptible, and Oak, Chestnut and Apple (Jonathan and Delicious) susceptible. Apple, Hop-Hornbeam, Sassafras and Hickory are thought most likely to harbour the fungus in nature. Preliminary attempts to isolate it from wild and abandoned Apple trees near centres of infection have failed. Wilt symptoms did not develop on inoculated Red Oak seedlings placed in a nearly saturated atmosphere, although tyloses and gums developed in the xylem; leaf discoloration also occurred. Inoculated Oak trees transpired more rapidly than controls during the first 16 days after inoculation, but from the 17th day transpiration was more rapid from healthy trees. In diseased living Oaks the fungus occurs in the xylem of roots, stems, petioles and leaf-blades but not in the phloem until the tree dies. On cut twigs, it grows more abundantly in the phloem and cambial regions than in the xylem. Symptoms on inoculated trees almost always occurred on leaves on the same side as the site of inoculation. [Cf. *F.A.* 18 No. 3017.]

4242. BRETZ, T. W. The Allegheny Chinkapin and two exotic Oaks susceptible to Oak wilt. *Plant Dis. Repr.* 41 (4), 1957 (368). A.P.B.

Castanea pumila, *Quercus brutia* and *Q. lusitanica* all proved susceptible when inoculated with the Oak wilt fungus under nursery conditions.

4243. GILLESPIE, W. H., SHIGO, A. L., and TRUE, R. P. The degree of mat-production control obtained by girdling Oak wilt trees in West Virginia and some factors influencing mat formation in girdled trees. *Plant Dis. Repr.* 41 (4), 1957 (362-7). 5 refs. A.P.B.

Of 117 diseased trees studied in autumn 1956, 103 had been deep girdled after symptoms appeared in the summer. Girdling reduced mat production to a great extent, but 10% of the trees girdled before 1st August and 20% of those girdled in August formed some mats; in these trees a high degree of defoliation was observed at the time of girdling.

Larger trees died more slowly after girdling, but there was no relationship between size of tree and mat formation by the fungus. There are indications that diseased Black Oak forms mats less frequently after deep girdling than Red or Scarlet Oak. [Cf. *F.A.* 18 No. 3023.]

4244. STAMBAUGH, W. J., and FERGUS, C. L. Longevity of spores of the Oak wilt fungus in overwintered nitidulid beetles. *Plant Dis. Repr.* 40 (10), 1956 (919-22). 14 refs. A.P.B.

Conidia in or on insects, survived for a maximum of 94-121 days, whereas ascospores survived for 151 or more days. Insects coming into contact with ascospores on mycelial mats formed in the autumn are therefore carrying viable spores at the end of their hibernation. [Cf. *F.A.* 17 No. 2962.] *From authors' summary.*

4245. DAS-GUPTA, S. N., and KAMAL, M. Die-back disease of *Polyalthia longifolia*. *Abstr. in Proc. 40th Indian Sci. Congr., Lucknow 1953, 1954* (79-80). C.G.B.

Isolations made from a number of diseased trees under aseptic conditions revealed that 4 fungi are associated with the disease, viz. *Phomopsis*, *Diplodia*, *Chaetomium* and *Fusarium*, of which the first two predominate.

Cankers, Stem Rusts etc.

See also Nos. 3725, 4231, 4365, 4374-5, 4569.

4246. HAWKSWORTH, F. G. Note on the susceptibility of Indian Paintbrush to *Cronartium filamentosum*. *Plant Dis. Repr.* 40 (6), 1956 (581-2). 6 refs.

In view of the fact that rust infections of *Castilleja* spp. are frequently found in the neighbourhood of Ponderosa Pine infected with *Cronartium filamentosum*, *Castilleja austromontana* was experimentally and successfully inoculated with this fungus. It is suggested that *Castilleja* spp. are alternate hosts of the rust and are possibly of importance in spreading the disease.

4247. MILATOVIĆ, I., and ŠABADOS, A. Cytophora-rak topole. [Poplar canker caused by *Cytospora chrysosperma*.] *Šum. List.* 80 (3/4), 1956 (120-4). 6 refs. [Croat.]

This canker was found in 1955 in Slovenia on an area of ca. 300 sq. m. of Poplar plantations causing the death of many branches.

4248. DONAUBAUER, E. Zur Kenntnis von *Chondroplea populea* (Sacc.) Kleb. (Syn: *Dothichiza populea* Sacc. et Briard), dem Erreger des Pappelrindentodes. [Our knowledge of *D. populea*.] *Gemeinschaft zur Förderung der Pappelkultur in Österreich, Wien.* [1957]. pp. 14 + 2 sets of drawings, 1 map. 15 refs. [G.]

Describes, chiefly for the practical forester, the symptoms and course of the disease, conditions favouring infection, prophylaxis (silvicultural, chemical and by resistance breeding) and control (mechanical) and gives data on the extent of the epidemic in Austria.

4249. KRSTIĆ, M. *Dothichiza*—rak ozbiljno ugrožava topole. [*Dothichiza canker—a serious threat to Poplars.*] *Šumarstvo* 9 (6/7), 1956 (346–52). 6 refs. [Serb.e.f.]

Widespread infection of young Poplars by *D. populea* was observed in Serbia in 1956. A brief description is given of the type of injury caused, the pathogen, and its distribution in Serbia. Control measures recommended for nurseries and plantations are the removal and burning of infected twigs and bark, and spraying with fungicides.

4250. HERPKA, I. Pojava ugibanja kore na topolama (Prethodni izvjestaj). [*Bark disease of Poplars (Preliminary communication).*] *Šum. List* 80 (9/10), 1956 (282–99). 14 refs. [Croat.croat.]

Describes in some detail cases of bark disease caused by the fungus *Dothichiza populea* in nurseries, clones, young and old plantations, and old Poplar stands in Croatia. *Populus candicans* was found to be the most resistant species.

4251. HOČEVAR, S. Razširjenost in zatiranje kostanjevega raka v Sloveniji. [*Distribution and control of Endothia parasitica in Slovenia.*] *Gozd. Vestn.* 14 (2/3), 1956 (62–9). [Sloven.]

Contains information on the importance of *Castanea sativa* in Slovenia, the history of the disease, quarantine measures, treatment of seeds with a 0.5% solution of formalin, control of the fungus on stumps, search for resistant forms, varieties or species, and the agenda of the 3rd Yugoslav conference on *E. parasitica*, held in Ljubljana on 7–10 Dec., 1955.

4252. KRSTIĆ, M. Rad na indirektnom suzbijanju endotioze u svetu i kod nas. [*Indirect control of Endothia parasitica in Yugoslavia and in other countries.*] *Šumarstvo* 8 (12), 1955 (723–34). 12 refs. [Serb.e.f.]

Reviews research work done in the U.S.A., Italy, and Switzerland. Two centres for *Castanea mollissima* resistant to *E. parasitica* have been set up in Yugoslavia since 1952, in Belgrade and Skopje. The author describes in some detail the properties of different hybrids produced in Beltsville, Md., and imported into Yugoslavia, and the behaviour of different seedlings there.

4253. BIRCHFIELD, W., and WEBER, G. F. Blight fungus invades Chestnut from killed twigs. *Plant Dis. Repr.* 41 (4), 1957 (359–61). 8 refs. A.P.B.

Observations on American Chestnut in western N. Carolina showed that coppice shoots had become infected with canker merely by coming into contact with twigs from trees killed by the canker. *From authors' summary.*

Foliage Diseases

See also No. 3936.

4254. SCHÜTT, P. Untersuchungen über Individualunterschiede im Schüttelefall bei *Pinus sylvestris* L. [*Individual differences in susceptibility of Pine to attack by Lophodermium pinastri.*] *Silvae Genet.* 6 (3/4), 1957 (109–12). 6 refs. [G.g.e.f.]

In Pine stands infected with needle-cast disease, heavily and lightly attacked ('positive' and 'negative') trees were selected for grafting under greenhouse conditions, after which they were inoculated with the disease. A significant difference was evident in degree of attack on 'positive' and 'negative' scions. No relationship could be found between root development and severity of the disease.

4255. FISCHER, W. Zur Föhrenschütte *Lophodermium pinastri*. [*L. pinastri.*] *Schweiz. Z. Forstw.* 108 (4/5), 1957 (260–70). [G.f.]

Discusses the biology of the fungus, host susceptibility, and control (chiefly silvicultural). In dense, pure, young stands the disease causes excessive thinning out, killing chiefly non-dominant, fine-branched trees, but if hardwoods are used as fillers (best in alternate rows) their leaves, both green and fallen, act as screens against infection. Limited observation also suggests that natural regeneration under shelter may be free of the disease in Switzerland, presumably owing to selective survival.

4256. BRENNJEZEN, B. Niebezpieczeństwo zwiększenia szkód powodowanych przez skrzetaka sosnowego. [*Danger of increased damage by Melampsora pinitorqua.*] *Las Polski, Warszawa* 31 (2), 1957 (7, 10). [Pol.]

The area of Pine stands in Poland in which the appearance of *M. pinitorqua* was reported, increased from 286 ha. in 1953 to 1061 ha. in 1955. Silvicultural and chemical methods of control are described.

4257. [Resistance of Poplar hybrids to rust.] *Ärsberätt. Fören. Växtförädl. Skogsträd* 1954, 1955 (11). [Sw.]

At Ekebo, where *Mercurialis perennis*, the alternate host of *Melampsora rostrupii*, was abundant, *P. tremuloides* was completely resistant, and *P. tremuloides* × *P. tremula* slightly, *P. tremuloides* × *P. davidiana*, moderately and *P. tremula* × *P. davidiana* very susceptible.

4258. BERNALUX, P. Contribution à l'étude de la biologie des *Gymnosporangium*. [*The biology of Gymnosporangium spp.*] *Ann. Epiphyt.* 7 (1), 1956 (1–210). 20 pp. of refs. [F.] E.M.B.

A comprehensive study in 3 parts. Part I deals with the history, taxonomy, life cycle, and distribution of *Gymnosporangium* spp. in general, and with the Mediterranean species in particular, and also with the methods and techniques used in this study. Part II presents a detailed study of 5 species found in the Mediterranean, their range, taxonomy, cycle of development, morphology, biology, and relationships with the host. Part III draws general comparisons and conclusions.

More precise data on the most likely time of infection of orchard trees give a better chance of successful control by the use of fungicides. Control by elimination of the alternate host, *Juniperus* spp., is only rarely possible.

4259. PARTRIDGE, A. D., and RICH, A. E. A study of the Ash leaf rust syndrome in New Hampshire: suspects, incitant, epidemiology, and control. *Abstr. in Phytopathology* 47 (4), 1957 (246).

Gives the moisture and temperature range for basidiospore production and infection by *Puccinia peridermiospora*. The Ash is most attacked between 15 May and 20 June, while *Spartina* spp. are most infected between the 20th days of July and August. Of 26 fungicides tested, Bordeaux mixture, diclone, griseofulvin, Mycostatin (Nystatin) and ziram gave partial control. The data are derived from greenhouse and field tests.

4260. [Blights of Arizona Cypress.] *Rep. Steast. For. Exp. Sta.* 1956, 1957 (36).

Phomopsis blight was controlled with Special Semesan spray at 1 lb./100 gal. water, applied weekly during active growth. A new tip-blight of this species has appeared, with which *Sclerotium bataticola* and *Alternaria tenuis* are commonly associated.

4261. MILLER, J. H. *Elsinoë* on Southern Red Oak. *Mycologia* 49 (2), 1957 (277-9). 2 refs. P.R.

Description of *Elsinoë quercus-falcatae* sp. nov., the *Elsinoë* stage of a fungus present on some specimens of leaves of *Quercus falcata*; its *Sphaeloma* stage was recorded as a spot anthracnose by Jenkins and Bitancourt [see *F.A.* 13 No. 3120].

4262. SNYDER, H. D. Single spray control of *Gnomonia veneta* on *Platanus occidentalis* and *P. acerifolia*. *Abstr. in Phytopathology* 47 (4), 1957 (246).

Sampling data are given on number of healthy leaves retained, numbers with necrotic veins, fruits, living shoots and blighted twigs on 31 *P. occidentalis* and 118 *P. acerifolia* sprayed with a delayed dormant application of PMAS (10% phenyl Hg acetate, 1 pint/100 gal.).

4263. MIELKE, J. L. Aspen leaf blight in the Intermountain region. *Res. Note Interm. For. Range Exp. Sta.* No. 42, 1957. pp. 5. 10 refs.

Notes on the distribution and hosts, epidemiology and symptoms of, and damage caused by, *Marssonina populi*, which attacks the leaves and shoots of young *Populus tremuloides*.

Other Diseases caused by Fungi or Bacteria

4264. JEWELL, F. F. Preventing cone rust on Slash Pine by pollination techniques used in breeding programs. *Phytopathology* 47 (4), 1957 (241-2). 1 ref.

Cronartium strobilinum, with alternate stages on Oak leaves and Pine cones, is shown not to have infected cones protected by pollen bagging between the third weeks of January and February. This appears to be the period of infection, and chemical control on a wider scale may be practicable provided that pollen or flowers are not damaged by the fungicides.

444. Virus Diseases

See also Nos. 4206, 4370.

4265. TOKUSHIGE, Y. [Metabolic changes in *Paulownia* affected by witches' broom.] *Science Bulletin of the Faculty of Agriculture, Kyushu University, Fukuoka* 15 (3), 1955 (287-331). Many refs. [Jap.e.e.] A.P.B.

Eight papers on: (1) amylase and peroxidase, (2) catalase, (3) chlorophyll and photosynthesis, (4) accumulation of soluble sugars, (5) inhibition of translocation of starch, (6) decrease of starch synthesis in, from and by the leaves, (7) inhibition of translocation of carbohydrates (including N and C/N ratios) by the tree, and (8) the decrease of carbohydrate and N content of shoots. [Cf. *F.A.* 13 No. 3125.]

45. Damage by Animals

4266. PAVLOVSKIĬ, E. N., and ŠTAKELJBERG, A. A. [Editors]. *Vrediteli lesa: spravochnik. [A handbook of forest pests [in the U.S.S.R.]]* Izdatel'stvo Akademii Nauk SSSR, Moscow & Leningrad. 1955. 2 vols. pp. 1097. Many refs. in text. [Russ.] Price *Roubles* 48.95 [40s.]

Lists forest pests under the classes: Mammalia, Aves, Insecta, Arachnida, Gastropoda and Nematodes, giving, where available, ecological data, the general area of distribution, type of damage and literature references to the species. Alphabetical indexes of plant and animal species are provided.

451. Mammals

See also Nos. 3683-5, 4281.

4267. GRANT, P. J. Opossum damage in Beech forests, Ruahine Range, Hawke's Bay [New Zealand]. *N.Z. J. For.* 11 (3), 1956 (111-3).

Describes damage to *Podocarpus ferrugineus* and *Nothofagus fusca*, consisting of extensive barking of the upper parts of stems and branches. [Cf. *F.A.* 14 Nos. 50, 467.]

4268. SCHINDLER, U. Erdmaus-Bekämpfungsversuche im Gradationsjahre 1955. [Research on the control of *Microtus agrestis* during the mass increase of 1955.] *Z. Pflkrankh.* 63 (12), 1956 (694-704). 7 refs. [G.g.e.] E.M.B.

The chlorinated hydrocarbons toxaphene, endrin [cf. *F.A.* 17 No. 4123; 18 Nos. 1824-5], aldrin and isodrin, used as emulsions or dusts, effectively controlled the outbreak when applied at rates 5 times those for insect control. The most effective control in practice was obtained by spraying grass and other surface vegetation with 4-6 kg. of 50% toxaphene emulsion or 1-1.5 kg. of 30% endrin emulsion per ha. *From author's summary.*

4269. ENE, M., and ALMĂȘAN, H. Pîrșul de alun. [Dormice.] *Rev. Pădurilor* 71 (7), 1956 (449-51). 7 refs. [Rum.russ.g.]

An increasing number of nesting boxes installed in Rumanian forests in order to attract insectivorous birds, are permanently occupied by dormice. Figures are given, and damage to shoots and branches by gnawing the bark is described and illustrated. [Cf. *F.A.* 17 No. 101.]

4270. [Damage to Ponderosa Pine cone crops by red squirrels (*Tamiasciurus hudsonicus*)] *Rep. Interm. For. Range Exp. Sta.* 1956, [1957] (8-9).

In the Kootenai National Forest, N.W. Montana, red squirrels cut, on an average, 66% of maturing cones in successive crops in 1953-56. A sheet of

smooth aluminium 18 in. wide, nailed in a continuous band around the boles of isolated trees 5-7 ft. above ground, prevented squirrels from climbing. It was found that 5.3 ft. of 'crown isolation' prevented squirrels from jumping from unprotected to protected trees.

4271. BURGESS, J. M. **Damage to bark of Sycamore by grey squirrels.** *Abstr. of thesis, in J. Oxf. Univ. For. Soc. (Ser. 4) No. 5, 1957 (15-6 + 2 photos).* 6 refs.

A study was made in 1954 of a small plot of 12-year-old *Acer pseudoplatanus* coppice at Wytham near Oxford. The 52 stems showed a total of 111 wounds, the age of which was investigated. It was apparent that no squirrel damage had been inflicted until the trees were 6 years old. During 1954 a total of 1220 sq. cm. of bark was gnawed from the stems within the study plot, distributed within the year as follows: Jan. to mid-June 20 sq. cm., mid-June to mid-July 1000 sq. cm. (on 8 stems), mid-July to end of August 200 sq. cm. (on 1 stem). Most of the old wounds also appear to have been inflicted at midsummer, a period when starch content of the cortical tissues of young Sycamore is at a maximum. There appears to be some relation between heavy damage and periods of low summer rainfall.

4272. HAŠEK, J. Siláž z lesní buřeně jako prostředek ochrany lesa proti škodám, působeným spárkatou zvěří. [Ensilage of forest weeds as a measure to protect forests against damage done by deer.] *Lesn. Práce* 35 (6), 1956 (258-63). [Cz.]

A substantial reduction of damage (browsing, tearing the bark off etc.) and a simultaneous improvement in the health of the deer have been noted during the last 16 years in the Řečice forest near Radhošť (Czechoslovakia), where selected forest weeds, e.g. *Senecio* sp., *Rubus idaeus*, *Gentiana asclepiadea*, *Dryopteris filix-mas*, *Polypodium* sp., and the foliage of some trees, e.g. *Acer platanoides*, *Fraxinus excelsior*, are ensilaged in June-July, and the silage offered from December daily (or every 2-3 days in the mountains) in mangers or on low 'tables', with an addition of hay and chestnuts, rock salt being placed near by.

4273. VANĚK, J. Regenerace sazenic lesních dřevin po poškození zvěří. [Regeneration of young forest trees damaged by deer.] *Lesn. Práce* 35 (7), 1956 (314-9). [Cz.]

In nursery tests with 2-year plants of *Pinus sylvestris*, *Picea abies*, *Larix decidua*, *Quercus rubra*, *Tilia parvifolia*, *Acer platanoides* and *Fagus sylvatica*, and 3-year plants of *Abies alba*, deer damage was imitated by clipping with shears. This was found often to be lethal if done below the lowest bud, mortality averaging 35%; if done above the lowest bud, the survival figure was almost exactly the same as for controls. *P. sylvestris*, *L. decidua* and *T. parvifolia* were the most sensitive. Clipping below the lowest bud also caused the greatest decrease in height increment, while cutting above it caused a minor decrease (for *Q. rubra* even a small increase); clipping just below the terminal bud usually caused an increase, *P. sylvestris* and *Tilia parvifolia* being exceptions.

452. Birds

See No. 4281.

453. Insects

See also Nos. 3675, 3723, 4835.

4274. BONGBERG, J. W. **A status report on conditions of forest insects in the United States 1956.** *F.A.O. Plant Prot. Bull.* 5 (8), 1957 (117-28).

[Cf. F.A. 18 No. 1834.] In comparison with conditions during the past few years, there was a marked decrease in the scope and severity of infestations during 1956.

4275. WELLINGTON, W. G. **The synoptic approach to studies of insects and climate.** *Repr. from Annual Review of Entomology, Stanford, Calif.* No. 2, 1957 (143-62). 80 refs.

A review of recent (1949-56) literature dealing with the effect of climate (and more particularly weather) on the micro-environment, behaviour, and bionomics of insects.

4276. ZECK, E. H. **Wattle tree insects.** *Agric. Gaz. N.S.W.* 67 (7), 1956 (369-71, 377). I.M.I.

Notes on some longicorn beetles, weevil and moth borers and other insects, the type of damage they inflict and their control.

4277. [Defoliators of Eucalypts and Pines.] *Rep. Dep. For. S. Afr., 1954/1955, 1956 (8-9).*

Grasshoppers (*Stinksprinkaan*) have defoliated 40 acres of young *Eucalyptus paniculata* and have also destroyed a large number of *E. saligna* transplants in a nursery. Plantations of *Pinus patula* have been completely defoliated by *Euproctis terminalis* and *Pachypasa capensis*. Populations of both these insects are building up and there seems to be no natural control.

4278. KOVAČEVIĆ, Ž. Die Probleme des Forstschutzes in Jugoslawien—Übersicht der wichtigsten Forstschädlinge. [The problem of forest protection in Yugoslavia—review of the most important forest pests.] *Anz. Schädlingssk.* 30 (5), 1957 (65-9). [G.]

An enumeration of species with brief notes, and an appendix listing all insects recorded on Poplar in Yugoslavia.

4279. Insekten und Pilzkrankheiten der Pappeln. [Insects and fungus diseases of Poplars.] *Kurzmitt. schweiz. Anst. forstl. Versuchsw.* No. 4, 1955. pp. 11. [G.]

Contains a classified list of 259 insect species occurring on Poplars. Of the 26 species known to be injurious, the 8 most serious pests are discussed, with notes on control. Forty-two pathogens, mostly fungi, are also discussed with reference to the diseases caused and (where possible) suggested control measures and the susceptibility of various Poplar varieties.

4280. ZARCO, E., and CEBALLOS, G. **Insectos perjudiciales al chopo en España.** [Insects damaging Poplar in Spain.] Servicio de Plagas Forestales, Dirección General de Montes, Caza y Pesca Fluvial, Ministerio de Agricultura, Madrid. 1956. pp. 125. [Span.]

Illustrated descriptions with notes on the life history of a large number of Coleoptera and Lepidoptera and also a few Hemiptera and Diptera.

4281. GÄBLER, H. Tierische Samenschädlinge der einheimischen forstlichen Holzgewächse. [Seed pests of indigenous woody forest plants.] Neumann Verlag, Radebeul and Berlin. 1954. pp. 56. 74 refs. [G.] Price DM.2.25 [3s. 10d.].

A short illustrated guide to identification and control for the practical forester, listing the more important insects, rodents and birds, and including a list of pests by woody plants attacked.

4282. GYÖRFI, J. A körös, a juhar és a szil magkárosítói. [Injurious insects of Ash, Maple and Elm seeds.] Erdész. Kutatás., Budapest 1956 (2), (131-9). 15 refs. [Hu.russ.e.g.]

Contains biological notes on *Lignopodes*, *Conartaria*, and *Tortrix* on Ash seed; *Bradybatus* spp., *Nepticula* spp., *Crobyliphora*, and *Pamene* on *Acer* seed; and *Anthonomus* and *Orthosia* on Elm seed. The first and second are parasitized by *Habrocytus* sp. and *Geniocerus* spp. respectively.

Insects: Natural and Biological Control

See Nos. 4296, 4298, 4305, 4309-12, 4316, 4319-20, 4322, 4325, 4331, 4337, 4347, 4356-7, 4359-60.

Insects: Chemical Control (General)

See also Nos. 4291, 4293-4, 4297, 4299, 4302, 4308, 4322-4, 4329, 4331, 4333-4, 4339, 4341-2, 4348, 4351-2.

4283. HALLER, H. L. Common names of insecticides. *J. econ. Ent.* 50 (2), 1957 (226-8). 1 ref.

A list of ca. 100 names, superseding the existing one [see *F.A.* 16 No. 4293]. Some of the chemical definitions, particularly of the organic P compounds have been brought into accord with the usage of Chemical Abstracts.

4284. Physical properties of [insecticidal] sprays prove a key to toxicity. *Rep. Calif. For. Range Exp. Sta.* 1956 [1957] (36-7).

Discusses briefly some of the factors (e.g. type of solvent, movement by the insects, size of dose) influencing crystal shape, and the effect of crystal shape on toxicity.

4285. APT, Ö. Hexaklórcyklohexánal végzett csemeterékénységi kísérletek. [Experiments on the susceptibility of plants to BHC.] Erdész. Kutatás., Budapest 1955 (3), (19-22 + smries. in suppl.). 6 refs. [Hu.russ.e.g.]

Five-week seedlings of Scots and Austrian Pine, Norway Spruce, and Larch, and 2-year Lime and Sycamore Maple, did not suffer in shoot or root development even when 10 times the normal dosage of BHC was used as a soil disinfectant, either in holes along the rows or sprayed. The formulations tested included a solution in acetone, an emulsion with cresylic acid, and Agritox [BHC-type] powder and spray. [Cf. *F.A.* 17 No. 1813.] From author's summary.

4286. ROSE, G. J. Ultra-low-volume spraying in Africa. *World Crops* 9 (2), 1957 (60-2). O.R.E.

Describes equipment used in newly developed concentrated spraying techniques, and briefly reports, *inter alia*, on their application against a lymantriid caterpillar on Wattle up to 65 ft. high. Good control was obtained with $\frac{3}{4}$ lb. of endrin in 3 gal. of diesel oil per acre, the sprayer being moved down alternate rows.

4287. BILIOTTI, E. CHARMET, F., and GRISON, P. Études sur les traitements par brouillards insecticides en forêt. [Studies in the control of forest pests by means of aerosols.] *Ann. Épiphyt.* 6 (2), 1955 (229-84). 72 refs. [F.] E.M.B.

Discusses the character of outbreaks of *Thaumetopoea processionea* and *T. pityocampa* and other defoliators in France, methods of determining the season most suitable for chemical control, and factors affecting the application of insecticides. In view of the great importance of obtaining a homogeneous distribution of insecticides, tests were devised and carried out over 1952-54 in which larvae were exposed on branches or in cages attached to poles, or suspended by meteorological balloons at various distances from the line of fog generators and at various heights. The data collected from the tests are analysed statistically and their value in estimating the efficacy of different treatments is demonstrated. The effects of the treatments on other insect fauna of the forest are also discussed.

4288. MAKSIMOVIĆ, M., and RADIN, M. Primenjena ručno zamagljivača u našim šumama. [The application of hand mist-generators in Yugoslavian forests.] *Šumarstvo* 9 (1/2), 1956 (69-74). 2 refs. [Serb.]

From experience in 1955 it is concluded that the German patent 'Schwingfeuer' is only economic for areas < 100 ha. in coppice and dense young stands. Over large areas of high forest, aerial operations are cheaper.

Orthoptera

See No. 4277.

Isoptera

4289. CIAMPOLINI, M. Osservazioni sul *Calotermes flavicollis* (F.) (Isoptera) in Toscana, sua diffusione e suoi rapporti con le arboree viventi. [C. *flavicollis* in Tuscany, its distribution and its relations to living trees.] *Redia, Firenze* (Ser. 2) 39, 1954 (291-300 + 3 plates). 27 refs. [It. i.e.] I.I.E. Reports the discovery of *C. flavicollis* in Tuscany, with an account of its life cycle and the woody species in which it has been found living and which it may directly injure: *Tilia europaea*, *Quercus ilex*, *Platanus occidentalis*, *Ulmus campestris*, *Acer campestre*, *Robinia pseudoacacia*, *Sophora japonica*, *Q. robur*, *Celtis australis*, *Populus 'canadensis'*, *Morus alba*, *Olea europaea*, *Ficus carica*, *Juglans regia*, *Magnolia grandiflora*, *Cinnamomum camphora*, *Viburnum* sp., *Prunus avium* and *Liriodendron tulipifera*.

4290. Termites in forest trees. *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (67).

Porotermes adamsoni is a major pest of commercial hardwood forests in the alpine regions of

New South Wales and Victoria. Studies of the root systems of 6 infested trees, felled for sawlogs, showed that 48 of the 90 large roots radiating from the stumps contained termite galleries. The termites made galleries in and adjacent to the roots for distances of up to 29 ft. from the stump. The galleries outside the roots were associated with moist ground, and there was no evidence that this termite obtained an entry into trees via the roots, or spread from tree to tree by this means.

4291. FONSECA, J. P. DA. Emprêgo de insecticidas orgânicos no combate a cupins subterrâneos nocivos a mudas de eucalipto. [The use of organic insecticides in the control of subterranean termites damaging Eucalypt seedlings.] *Arquivos do Instituto Biológico, São Paulo* 21, 1952/54 (13-9). [Port.e.] L.S.

A continuation of earlier experiments [cf. *F.A.* 15 No. 1293]. (1) 40% DDT, applied in aqueous solution or as a powder, proved almost totally ineffective. (2) BHC (54% γ isomer) in powder form gave even better results than arsenic preparations. A concentration of 6 g./100 kg. sifted soil is recommended.

Thysanoptera

4292. LINDQUIST, O. H., and HARNDEN, A. A. A new record of thrips on Jack Pine in Ontario. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (2), 1957 (1).

Gnophothrips piniphilus was collected from *Pinus banksiana* in Ontario. No previous record is known in N. America of this species causing injury to native Pines.

4293. VITÉ, J. P. Gegenmassnahmen gegen *Taeniothrips laricivorus* Krat. und ihre Zweckmässigkeit. [Measures to control *T. laricivorus* and their usefulness.] *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie, Berlin* 1954, 1955 (60-3). [G.] I.I.E.

Rapid recolonization of heavily infested trees after spraying during the growing season is thought to be due to rapid growth of shoots, which exposes fresh tissues, untouched by the chemical, to attack. The use of the systemic insecticides (Metasystox at relatively high concentrations of 2.5-5%) would overcome this difficulty.

Hemiptera

See also No. 3676.

4294. MORETTI, M. F. D. Studies on the potato leafhopper *Empoasca fabae* as a nursery pest. *Abstr. of thesis, in Dissert. Abstr.* 16 (12), 1956 (2263). O.R.S.

Life-history data were obtained in the greenhouse and field, using micro-cages attached to Maple and Birch leaves. Excessive feeding causes stunting and weakening of trees, curling and rosetting of leaves, deformation of growth and finally death of leaves and terminals. Infested plants usually require additional pruning and extra years of growth before they are marketable. Preferred host plants seem to be *Acer platanoides* var. *schwedlerii*, *A. platanoides* and *Betula alba*, especially the first. Hydraulic spraying, and

application by mist blowers from two sides, were satisfactory methods of applying chemicals. Of 31 contact poisons tested, DDT 25% emulsion gave initial and residual control without damage to the plants. Systemic poisons were less effective. Four applications of dilute 25% DDT emulsion in the season are recommended.

4295. SORAUER, P. [Edited by BLUNCK, H.] *Handbuch der Pflanzenkrankheiten. Band V. Tierische Schädlinge an Nutzpflanzen.* 2. Teil. 4. Lieferung. Homoptera 2. Teil. [Manual of plant pathology. Vol. V. Animal pests of useful plants. Part 2, No. 4. Homoptera part 2 [Aphidoidea, Coccoidea].] Paul Parey, Berlin. 1956. pp. [iii] + 577. Many refs. [G.] Price [£11. 11s.] [Cf. *F.A.* 18 No. 630.]

4296. PSCHORN-WALCHER, H., and ZWÖLFER, H. The predator complex of the White-Fir woolly aphids (genus *Dreyfusia*, Adelgidae). *Z. angew. Ent.* 39 (1), 1956 (63-75). 19 refs. [E.e.g.] O.H.

[Cf. *F.A.* 18 No. 636.] Proposes a provisional subdivision of the species on ecological grounds, classifies predators by importance, host specificity, stages attacked etc. and discusses the interaction of factors in the collapse of outbreaks.

4297. FOWLER, V. W., and GAIR, R. Notes on the biology and chemical control of the Spruce pine-apple gall *Adelges*. *J. R. hort. Soc.* 81 (1), 1956 (29-36). 20 refs. L.L.

Experiments in 1955 in nurseries at Woking and Darley Dale, Derbyshire, showed that 0.05% BHC either as a dispersible powder or as a miscible preparation will virtually eliminate *A. abietis* for a period of a year at least. It is best applied in early or mid-April. [Cf. *F.A.* 15 No. 3793.]

4298. TEUCHER, G. Die Bedeutung wichtigerer einheimischer Feinde der Nadelholzläuse (Adelgidae) für deren biologische Bekämpfung. [The significance of some of the more important native enemies of Adelgidae for their biological control.] *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie, Berlin* 1954, 1955 (63-9). 16 refs. [G.] I.I.E.

A brief review, with special reference to observations made at the Eberswalde Institute, on *Exochomus quadripustulatus*, a predator of *Adelges cooleyi*.

4299. MERKER, E., and EICHORN, O. Zur Biologie der gefährlichen Tannenläuse und ihre Unterscheidungsmerkmale im Freien. [The biology of dangerous Fir aphids, and their distinguishing characters in the field.] *Allg. Forst- u. Jagdztg.* 126 (5/6), 1955 (95-108). 21 refs. [G.g.e.]

On the basis of the literature and their own investigations in S. Baden, the authors discuss the history and present state of infestation in that country, the effect on the size and bionomics of *Adelges nordmannianae* and *A. piceae* of climatic factors, host species and plant part fed on, and the macroscopic differences between the two species, chiefly the wax-wool exudations of the numerous autumnal third generation of *A. piceae*, and the appearance (illustrated) of damaged shoots. *A. nordmannianae* causes defoliation and death of

shoots more rapidly, and the bark of shoots is not thickened. Chemical control is recommended chiefly for nurseries. E.605 [parathion], if sprayed repeatedly, gave satisfactory results. If infested trees are felled during the periods of aphid immobility, between December and March (starting somewhat later for *A. piceae*) they need not be burned, as the aphids will perish within ca. 4 weeks.

4300. JOHNSON, N. E., and WRIGHT, K. H. The Balsam woolly aphid problem in Oregon and Washington. *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 18, 1957. pp. 34. 17 refs.

A biological description with illustrations is given of *Adelges piceae*, with an account of the present outbreak on *Abies grandis*, *A. amabilis* and *A. lasiocarpa*. Methods of control are discussed.

4301. Massenaufreten der Sitkalaus. [Mass outbreak of *Neomyzaphis abietina*.] *Holz-Zbl.* 83 (70/71), 1957 (903). [G.]

Reports on a sudden severe outbreak of the pest, chiefly on *Picea sitchensis* and *P. omorika* in N.W. German coastal regions.

4302. CIAMPOLINI, M. Prove di lotta invernale contro le uova di *Lachnus longipes* Duf. [Trials of winter control of the eggs of *L. longipes*.] *Redia, Firenze* (Ser. 2) 39, 1954 (395-9 + 1 plate). [It. it. e.] I.I.E.

Very large numbers of eggs of *L. longipes* were found wintering on *Castanea sativa* branches. Spraying with 'winter oil' (41% mineral oil, 33% anthracene oil and 10% phenol) was very successful in killing the eggs, and good results were also obtained with dinitro-butylphenol, DNOC in oil, parathion and a paraffin/parathion mixture. Malathion and Diazinon used alone or with isolan were ineffective.

4303. SCHMUTTERER, H. Saugschäden an Eichen und Buchen durch Lachniden in Abhängigkeit von Ameisen-Trophobie. [Injuries caused by sucking lachnids on Oak and Beech in relation to ant trophobiosis.] *Z. angew. Ent.* 39 (2), 1956 (178-85). 10 refs. [G.g.e.] O.H.

Describes the morphology, bionomics, and association with ants of *Lachnus roboris*, *Schizodryobius longirostris* and *L. exsicicator*, and the injuries inflicted on their hosts by the two last-named where ant colonies abound. If access to the lachnids is denied to the ants by placing a glue barrier round the stem of the tree, a treatment recommended for young Oak and Beech, the lachnid populations soon decline.

4304. MÜLLER, H. Können Honigtau liefernde Baumläuse (Lachnidae) ihre Wirtspflanzen schädigen? [Can honeydew-excreting lachnids injure their hosts?] *Z. angew. Ent.* 39 (2), 1956 (168-77). 26 refs. [G.g.e.] O.H.

Discusses chiefly bark injuries to Beech by *Pterochlorus* [*Lachnus*] *exsicicator* and their relation to ants. Four-year-old Spruce, close to a colony of *Formica rufa*, and artificially inoculated with *Lachnus bogdanovi*, suffered severe deformation of shoots and heavy mortality, the degree of injury decreasing with distance from the ant run.

4305. HARTZELL, A. Red Pine scale [*Matsucoccus resinosae*] with special reference to its host plants and cold-hardiness. *Contr. Boyce Thompson Inst.* 18 (10), 1957 (421-8). 4 refs.

The seasonal history of the recently discovered bark scale, *Matsucoccus resinosae*, on Red Pine [cf. *F.A.* 17 No. 606] was investigated during 1954-56 at Yonkers, N.Y., and the various stages of the scale were observed and photographed. The insect was found to have 3 broods a year. Artificial infestation of 22 species of Pine revealed 3 new hosts—*P. tabulaeformis*, *P. densiflora*, and *P. densiflora* var. *umbraculifera*, all of oriental origin. Two coccinellids (*Coccinella transversoguttata* and *Cleis picta*) and a small hemipteran (*Xanotrachelia inimica*) were found to be predaceous on the scale. A study of cold-hardiness of *M. resinosae* on Red Pine under controlled conditions indicated that exposure to -10° to -20° F. for 4-7 hours killed > 99%. From this it may be deduced that rapid spread of the scale northwards would be retarded, at least until a race is evolved that possesses greater hardiness than the present race. *From author's summary.*

Lepidoptera

See also Nos. 3677-8, 4219-20, 4276-7, 4282, 4286-7.

4306. SCHEFER-IMMEL, V. Auftreten einiger bisher noch nicht oder nur selten an Pappel und Douglasie beobachteter Lepidopteren. [Lepidoptera newly or rarely observed on Poplar and Douglas Fir.] *Anz. Schädlingssk.* 30 (4), 1957 (57). [G.]

Acronycta leporina, *Macrothylacia rubi* and *Biston stratararius* on Poplar and *Tortrix viridana* on Douglas Fir.

4307. GEORGOPULOS, A. Besteht zwischen Länge der Frassgänge, Dicke der befallenen Stellen und dem Gewicht der Raupen von *Sciapteron tabaniforme* eine Beziehung? [Is there a correlation between the length of the larval galleries, diameter of the portion of stem attacked and the weight of larvae of *S. tabaniforme*?] *Anz. Schädlingssk.* 30 (5), 1957 (74-6). 2 refs. [G.]

No correlation could be found between these factors, nor yet between the height up the stem and length of larval galleries.

4308. GUYER, G., MOROFKY, W. F., and LEMMIEN, W. The evaluation of insecticides for control of the European Pine shoot moth under spring and summer conditions. *Quart. Bull. Mich. agric. Exp. Sta.* 39 (3), 1957 (432-7). 5 refs.

[Cf. *F.A.* 18 No. 3089.] Experiments were made in Michigan in 1956 on the control of *Rhyacionia buoliana*. Twelve treatments using 9 different insecticides were each applied to 40 trees of 6-year-old *Pinus resinosa*, by hydraulic spray, the spraying continuing until first sign of run-off. A spring application was made on 24 April when 70% of the insects were in the pupal stage. A 25% emulsion of DDT at 3 lb./100 gal. was the most effective against the larvae and pupae; none of the spring treatments controlled the larvae of the next generation. Treatments were repeated on 22 June, when the eggs were hatching but before the larvae had entered the buds. Again DDT gave the most satisfactory results and

where 2 applications were made at an interval of 10 days no live larvae were found by September. Guthion and parathion at $\frac{1}{2}$ lb./100 gal. were almost as effective as DDT; Phosdrin and Dow ET-15 significantly reduced larval infestation; Diazinon and the systemic phosphates Systox and Thimet were less successful; endrin was ineffective.

4309. ARTHUR, A. P. The indigenous parasites of the European Pine shoot moth, *Rhyacionia buoliana* (Schifferrmüller), (Lepidoptera: Olethreutidae) in Ontario. *Abstr. of thesis, in Dissert. Abstr.* 17 (5), 1957 (938). O.R.S.

The important parasites *Calliophanes comstockii*, *Scambus hispae*, *Itopectis conquisitor*, *Hyssopus thymus*, *Habrocytus* sp., and *Eurytoma* sp. are described and discussed.

4310. GYÖRFI, J. *Evetria turionana* Hb. fenyörügyilónca. [*Rhyacionia turionana*.] *Erdmőrnőki Főiskola Közleményei, Sopron* 1955 (107-9). 6 refs. [Hu.russ.g.]

Life history, diagnosis, and damage done by this plantation pest, new for Hungary. The larvae destroy the needles or terminal buds of 6- to 12-year *Pinus sylvestris*, the chief host. *P. montana*, *P. ponderosa*, and *P. strobus* are also attacked. Branch growth is weakened and death may follow heavy attack. Species of *Pimpla*, *Glypta*, *Pristomerus*, *Cremastus*, *Orgilus*, and *Entedon*, have been introduced for the control of the larvae, which are difficult to reach by other methods.

4311. TURČEK, F.-J. À propos de deux ennemis importants des ravageurs des glands. [Two important predators of acorn pests.] *Schweiz. Z. Forstw.* 108 (3), 1957 (194-6). 6 refs. [F.]

Describes observations in Central and South Slovakia during an epidemic of *Balaninus glandium* and *Laspeyresia splendana*, when *Garrulus glandarius*, *Apodemus sylvaticus* and *A. flavicollis* were found to feed on the larvae in the acorns.

4312. MARTIGNONI, M. E. Contributo alla conoscenza di una granulosis di *Eucosma griseana* (Hübner) (Tortricidae, Lepidoptera) quale fattore limitante il pullulamento dell'insetto nella Engadina alta. [A granulosis of *Semasia diniana*, a factor limiting its population density in the Upper Engadine.] *Mitt. Schweiz. Anst. forstl. Versuchsw.* 32 (7), 1957 (371-418 + 16 photos). 129 refs. [It.g.f.e.]

After reviewing the literature and describing his experimental methods and results, the author deals with the virus epidemic of 1953-55 in its relation to the epidemic of its host, which culminated in 1954. The granulosis is considered to have been the most important single factor in its decline. The potency of the pathogen declined from 1954 to 1955, suggesting a selective effect. The simultaneous appearance of the disease in widely separated parts of the region cannot be satisfactorily explained by transmission from individual to individual and from generation to generation. The question of 'induction' is raised. Two additional mortality factors, a microsporiosis and starvation, are briefly discussed. A fairly high population density is considered necessary before biological control with the virus can be promising.

4313. MARTIGNONI, M. E. Nach 45 Jahren: Wiederum eine Massenvermehrung der Tannentriebwickler in der Schweiz. [An outbreak, after 45 years, of Silver Fir leaf-rollers in Switzerland.] *Kurzmitt. Schweiz. Anst. forstl. Versuchsw.* No. 11, 1956 (1-3). [G.]

Incipient outbreaks of *Cacoecia murinana* and particularly *Semasia rufimitrana* are reported from Silver Fir stands > 30 years old. Possible control measures are discussed and insecticides containing Cl are considered hopeful, but the danger and cost of non-specific insecticides should limit their application to specially valuable stands.

4314. HERON, R. J., and PRENTICE, R. M. Jack Pine budworm in Pine plantations in the Spruce Woods Forest Reserve, Manitoba, in 1956. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (1), 1957 (2-3).

Scots Pine and Lodgepole Pine were attacked equally with Jack Pine. A marked difference in the degree of defoliation in neighbouring plantations was apparently attributable to differences in the prevalence of male flowers.

4315. POSTNER, M. Schädigung von Nadelholzjungpflanzen durch Raupen von *Cnephasia incertana* Tr. (Lepidoptera, Tortricidae). [Damage to young conifers by larvae of *C. incertana*.] *Forstw. Cbl.* 75 (11/12), 1956 (563-7). 16 refs. [G.g.]

Describes damage to 2-year-old seedlings of Larch and Douglas Fir by *C. incertana*.

4316. ČAPEK, M. Príspevok k poznaniu medzihostiteľ'ov parazitov dubových obal'ovačov *Tortrix viridana* L a *T. loefflingiana* L. [Intermediate hosts of the parasites of *T. viridana* and *T. loefflingiana*.] *Lesn. Čas.* 2 (4), 1956 (320-30). 14 refs. [Slovak.slovak.russ.g.]

T. loefflingiana has, as a rule, the same parasites as *T. viridana*. The results of research by other investigators and by the author lead him to the conclusion that the main parasites, such as *Itopectis maculator*, *Phytodietus polyzonias*, *Apechthis rufata*, *Horogenes exareolatus*, *Trichomma enecator*, *Apanteles ater*, *Actia crassicornis* and *Nemorilla floralis*, have 2-3 generations every year, the second generation living in *Cacoecia xylosteanae* and *C. rosana*, and the third (or also the second) in *Ancyliis mitterbacheriana*.

4317. STUBNYA, V. Az *Acrobasis* (Phycis) *consociella* Hbn. (Lep. Pyral.) károsítása csereseinkben. [Damage done by *A. consociella* in [Hungarian] *Quercus cerris* forests.] *Erdmőrnőki Főiskola Közleményei, Sopron* 1955 (149-55). 8 refs. [Hu.russ.g.]

An epidemic of unprecedented proportions occurred in 1954. The larvae bind the terminal leaves together, in some places leaving none undamaged. The leading shoot is atrophied and branch proliferation follows, which is particularly serious on pole crops in active height growth. Young crops are mostly favoured but older ones are not spared. The larvae feed in spring and summer; pupation

takes place in June, and flight in July. Pure stands of *Q. cerris* should be replaced by uneven-aged mixtures.

4318. PATOČKA, J. Vijačka *Hyphantidium terebrellum* (Lepidoptera, Pyralidae), škodca jedl'ó vých šušiek na Slovensku. [*H. terebrellum*, a pest of Silver-Fir cones in Slovakia.] *Lesn. Čas.* 2 (2), 1956 (162-73). 6 refs. [Slovak.russ.g.]

The author reared this insect from *Abies alba* cones collected in the tree crowns. It appears that the ♀s lay eggs directly in the green cones. The paper includes morphological descriptions of the larva and pupa, and a key for identifying the lepidopterous pests of Fir cones (larvae, pupae and imago).

4319. [Use of pigs to control *Nudaurelia cytherea*.] *Rep. Dep. For. S. Afr.* 1954/1955, 1956 (8).

A comprehensive inspection of Pine plantations in the Western Conservancy showed, by a pupal count, that the only areas where *N. cytherea* populations were building up were those in which pigs were not operating or where heavy logging debris made it difficult for pigs to forage freely. Arrangements were made to ensure free range for pigs in these areas. [Cf. *F.A.* 11 No. 723.]

4320. GYÖRFI, J. Erdészeti leg fontosabb téli araszolólepkék élősködő darazsai. [Hymenopterous parasites of the more important 'winter moth' pests of the forest.] *Erdőmérnöki Főiskola Közleményei, Sopron* 1956 (1), (89-95). 7 refs. [Hu.hu.russ.g.]

The 'winter moths', chiefly damaging orchards, include the genera *Cheimatobia*, *Hybernina*, and *Anisopteryx*, some species of which cause damage to forest trees, mainly to young Oak. The author lists, from several years of observation, 13 ichneumonid and 7 braconid parasites bred from larvae and pupae of *A. aceraria*, *A. aescularia*, *C. brumata*, *H. aurantiaria* and *H. defoliaria*. No chalcid parasites were found.

4321. BROWN, C. E. Bruce spanworm, *Operophtera bruceata* (Hulst), in Alberta. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (2), 1957 (3).

Analysis of material received in 1955 and 1956 revealed that this insect is increasing in Alberta. Throughout most of the area it fed on Poplar and Willow, but in Kootenay National Park it occurred also on Mountain Maple, Honeysuckle, Alder, and Birch.

4322. TEMPLIN, E. Auftreten, Bionomie und Bekämpfung des grossen Gabelschwanzes (*Dicranura vinula* L.). [Occurrence, bionomics and control of *D. vinula*.] *Wissenschaftliche Abhandlungen, Deutsche Akademie der Landwirtschaftswissenschaften, Berlin* No. 16 (Beiträge zur Pappelforschung No. 1) 1956 (102-30). 72 refs. [G.g.]

The paper, which is based on literature, field observations and experiments in the laboratory and in the open, covers also distribution, taxonomy, morphology, forest injuries, natural enemies etc. *D. vinula* has caused severe defoliation in many E. German Poplar plantations and nurseries, leading to serious losses on the poorer sites and among newly

planted trees. It is a voracious feeder, accepting with equal readiness leaves from all 34 Poplar and 10 Willow clones tested, but no other species. Mortality of young larvae was greatest on *Populus alba* and *P. canescens*. Flight and oviposition in central and northern E. Germany lasted from mid-April to August. The egg stage takes 12-17 days, the larval stage 36-46. No second generation was found. The egg parasite *Ooencyrtus vinulae* and the larval parasites *Apanteles affinis* and *Paniscus testaceus* are important. In control experiments with DDT (1) and/or BHC (2), and phosphoric-acid ester (3) preparations, only spraying with emulsions was effective. Dusting affected only the first two larval stages. Effective concentrations for (1) and (3) were 0.5%, for (2) 1%.

4323. TEMPLIN, E. Der grosse Gabelschwanz [*Dicranura vinula*.] *Merkbl. Inst. Forstwiss. Eberswalde (Abt. Forstschutz tier. Schäd.)* No. 19, 1955. pp. 7 + 8 photos. 3 refs. [G.]

Summarizes information on distribution, biology, enemies, injuries, economic importance, and control. Lists nine emulsions (DDT, BHC, or phosphoric acid ester formulations) and recommended concentrations. Dusting proved ineffective. Two further species, *D. erminea* and *Cerura bifida* are briefly described.

4324. TEMPLIN, E. Goldafterbekämpfung. [The control of *Euproctis phaeorrhoea*.] *Merkbl. Inst. Forstwiss. Eberswalde (Abt. Forstschutz tier. Schäd.)* No. 17, 1955. pp. 7. 3 refs. [G.]

Practical recommendations for mechanical and chemical control in orchards, forests, on roadsides etc., based on recent experience in E. Germany, including dosages of preparations, description of equipment, costs etc. Mistblowers using DDT emulsions or aerosols with good adhesive properties are recommended for the interior of forests, dusting (DDT and/or BHC preparations) for borders and single trees. [Cf. *F.A.* 16 No. 3205.]

4325. AUERSCH, O. Zur Kenntnis des Goldafters. [*Euproctis chrysorrhoea*.] *Beiträge zur Entomologie, Berlin* 5 (1/2), 1955 (96-126). 18 refs. [G.g.] I.I.E.

Notes on host plants, life history, natural enemies, parasites and diseases and population fluctuations. [Cf. *F.A.* 17 No. 631.]

4326. TEUCHER, G. Die praktische Überwachung der Nonne. [Field methods for checking population densities of *Lymantria monacha*.] *Merkbl. Inst. Forstwiss. Eberswalde (Abt. Forstschutz tier. Schäd.)* No. 20, 1955. pp. 17 + 1 plate. 6 refs. [G.]

Gives practical instructions for counting ♂ moths in traps containing ♀s; eggs, pupae and larvae on felled trees; and larvae by adhesive bands on standing trees; suggesting suitable dates, and, as a rough guide to critical egg densities for Pine and Spruce stands, presents a table of critical densities compiled for *Panolis flammea*.

4327. GÖRNITZ, K. Frassaauflösende Stoffe für polyphag an Holzgewächsen fressende Raupen.

[Substances arousing a feeding response in polyphagous caterpillars attacking tree species.] *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie, Berlin 1954, 1955* (38-47). 8 refs. [G.] I.I.E.

An attempt was made to discover reasons for the preference of certain polyphagous insects for trees rather than herbaceous species. When larvae of *Lymantria dispar* were offered certain herbaceous plants treated with tannin solutions, the intensity of feeding rose with the tannin concentration, but the insects failed, either in the first or in the second generation, to complete their full cycle of development. Other herbs, treated or untreated, were consistently rejected. Similar results were obtained with *Euproctis phaeorrhoea*, *Operophtera brumata* and *Amphidasis betularia*. *Malacosoma neustria* refused both treated and untreated plants of all herbaceous species tested.

4328. VAJDA, Z. Gubar ponovo ugrožava naše šume. [*Lymantria dispar* again threatens Jugoslavian forests.] *Šum. List* 80 (7/8), 1956 (220-5). [Croat.]

The latest mass outbreak of *L. dispar* in Yugoslavia is correlated with the high mean temperatures and low rainfall of the spring or summer, or both, in 1952 and 1953, such conditions being particularly favourable for the development of the insect. The author calculates that, from one completely healthy brood (500 eggs) in 1952, allowing for an 80% mortality and one generation per year, there would develop in 1956 enough broods to infest on the average each of the 500,000 Oak trees on an area of 1000 ha. with 12 broods; the respective figures for a 50% and 20% mortality would be 488 and 3200 broods per tree. He concludes that the intensity of the outbreak in a given area depends mainly on the number, size and health of the few single broods that happen to be in that area in a year characterized by a dry and warm spring and summer. The spring and summer seasons were wet and cold in 1954 and 1955, but this was not enough to control the outbreak that began in 1952-53. The author views with great apprehension the outbreaks of this pest in Yugoslavia, the damage being aggravated in mixed Oak stands by the inroads made on the Elms by *Ceratostomella ulmi*, and in both pure and mixed stands by mildews. He advocates a campaign for destroying the broods of *L. dispar* both in Oak stands and in orchards, the proper method being not scraping but painting over with a 1/5 mixture of kerosene and wood tar or else with pure kerosene.

4329. MILEVIĆ, K. Suzbijanje gubara u šumama NR Srbije 1955 god. zamagljivanjem iz aviona. [The control of *Lymantria dispar* in Serbian forests in 1955 by aerial mist-spraying.] *Zašt. Bilja* No. 35, 1956 (113-30). 9 refs. [Serb.e.] I.M.I.

The total area treated, in May/June, was 29,102 ha., chiefly coppice, with *Quercus robur*, *Q. sessiliflora*, *Q. conferta* and *Q. cerris*, as the main species. Spraying was started when *L. dispar* was in the second instar, using a 25% DDT emulsion at a rate of 500 g. active DDT/ha., but this dosage was increased to 625 and again to 750 g./ha. when *L. dispar*

reached the 4th-6th instars. Details of costs are given. From a visual examination the treatment was considered to be successful. [Cf. F.A. 17 Nos. 4189-90.]

Coleoptera

See also Nos. 3679-82, 4221-2, 4244, 4276, 4282.

4330. NEVES, C. M. BAETA. Notas sobre a entomofauna florestal portuguesa. (II). [Notes on Portuguese forest insects. II.] *Boletim da Sociedade Portuguesa de Ciências Naturais, Lisboa (Sér. 2)* 5, 1954/55 (44-53). 30 refs. [Port.] L.S.

[Cf. F.A. 14 No. 2490.] Notes on: *Myelophilus piniperda* and *Ips erosus* attacking *Pinus pinaster* and *P. pinea*; attack by *Lyctus brunneus* on *Eucalyptus globulus* and *Quercus suber*, and by *Sinoxylon sexdentatum* on *Castanea sativa*, and on aerial telephone cables; and hosts and distribution of *Oberea oculata* and *Oryctes nasicornis* var. *grypus*.

4331. HEERING, H. Zur Biologie, Ökologie und zum Massenwechsel des Buchenprachtkäfers (*Agrilus viridis* L.) I. u. II. Teil. [The biology, ecology, and population fluctuations of *A. viridis*. Parts I & II.] *Z. angew. Ent.* 38 (3), 1956 (250-87); 39 (1), 1956 (76-114). 119 refs. [G.g.e.] O.H.

A comprehensive paper based on the literature and laboratory and field work, particularly near Munich, where damage among planted Beech saplings was considerable. Deals with morphology, bionomics, and host specificity of forms or races (only the Beech form was investigated), distribution, outbreaks in Bavaria as related to habitat and recent local climate, susceptibility of mature trees and saplings to attack in connexion with site factors such as insufficient water and excessive insolation causing sunscorch on bark, host resistance, enemies, and control. Silvicultural measures of prevention and control, including the cutting back of infested saplings, are recommended. Of chemical methods, Systox proved effective, and bark treatment with DDT unsuccessful.

4332. CURRY, S. J. *Oemida gahani*, Distant. *Rep. For. Dep. Kenya 1954/55, 1957* (18-9).

The possibility is being studied of using *Gymnosporia luteola* trees, raised from seed, as traps in plantations, as this appears to be the species most commonly attacked by *O. gahani* in natural forest. Treatment of pruning scars, the focal point of attack, with various dressings showed that a bituminous substance 'Savacote 60', mixed with paraffin in the proportion of 2:1, is the most effective. Experiments with larvae indicate that living *Pinus patula* and *P. radiata* are immune to attack, their resin being lethal to the larvae. Young *Cupressus lusitanica* before heartwood formation also appears to be immune, and unpruned Cypresses, if vigorous, show very little attack though having dead lower branches.

4333. BUTOVITSCH, V. Nyare försök och erfarenheter vid bekämpandet av snytbaggen (*Hylobius abietis* L.) [Recent research and experiences in the control of *H. abietis*.] *Svenska Skogsvärdn. Tidskr.* 53 (2), 1955 (189-200). 7 refs. [Sw.g.]

In experiments in 1951 and 1952 on bundles of trap bark treated with various chemicals, a much higher catch was obtained with bark treated with E 605 forte [parathion], than with other chemicals or untreated controls. Pine and Spruce plants dipped before planting in Gesarol 50, a DDT preparation, were attacked less than controls, especially when fresh stumps had also been treated. The effect on Pine plants treated before autumn planting lasted over the following summer.

4334. **Pales weevil.** *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (42-5).

Grafted Virginia Pine seedlings planted in May on a site clear-cut in December were sprayed with a 2% heptachlor emulsion and further protected by traps consisting of shallow trenches containing several 18-in. Pine bolts 2-3 in. in diam., covered with fresh Pine branches and sprayed with the emulsion. Though some feeding occurred on 17 of the 25 seedlings, none was killed. Nearly 4000 weevils were collected in the traps from May to November, 83% of them being *Hylobius pales*.

4335. **OSTRANDER, M. D. Weevil attacks apparently unrelated to height of Eastern White Pine.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 67, 1957, pp. 2.

Examination of material cut from logs representing 97 trees aged 45 to 120 years showed that attacks of *Pissodes strobi* had been as frequent on trees > 60 ft. tall as on 10- to 20-ft. trees. As all the sample trees were from the Pack Forest, N.Y., additional data from other localities are necessary.

4336. **FARSKÝ, O. Zobonoska révoová—Rhynchites (= Byctiscus) betuleti Fabr. škůdcem topolů na Gabčíkovu.** [*R. betuleti—a pest of Poplars near Gabčíkovo.*] *Lesn. Čas.* 2 (4), 1956 (331-61). 51 refs. [Cz.russ.g.]

Studies in 1953/55 in the floodland forest near the Danube and especially in plantations near Gabčíkovo (S. of Dunajská Streda), showed that: (1) Plantations suffer more from *R. betuleti* if the sites are not regularly flooded. (2) Local species, e.g. *Populus alba*, *P. canescens*, *P. nigra*, *P. tremula*, suffer less damage than introduced Poplars. (3) In late summer and early autumn the feeding of young adults on leaves does little damage, but undeveloped leaves are sometimes attacked and this may kill not only the leaves, but often also the terminal buds, causing forks etc., similar damage occurring also in early spring, when young adults attack undeveloped buds. (4) By far the greatest damage is done by ♀s when they roll as many as 9 leaves together for their broods, and at the same time often damage the spring shoots; this causes irregular growth, and, if repeated in the following year, a shrub-like habit. (5) The proximal parts of the killed young shoots often begin to rot. Control measures mentioned are hand picking of the beetles, use of BHC (but not As insecticides, because of their toxicity to animals) and intensive raising of pheasants or poultry in or near the plantations.

4337. **PESSON, P., TOUMANOFF, C., and HARARAS, C.** Étude des épizooties bactériennes observées dans

les élevages d'insectes xylophages (*Rhyncolus porcatus* Germain, *Scolytus scolytus* Fabricius, *Scolytus (Scolytochelus) multistriatus* Marsham). [Study of bacterial diseases observed in insects attacking wood (*R. porcatus*, *S. scolytus*, *S. multistriatus*).] *Ann. Épiphyt.* 6 (3), 1955 (315-28). 11 refs. [F.] E.M.B.

A strain of bacteria (A) isolated from *R. porcatus* and two strains (B and C) isolated from *S. multistriatus* are described, and the results of experimental infections of *S. scolytus* are reported and discussed. Strain A is provisionally named *Paracolobactrum rhyncoli* sp. nov.; strain B, *Aerobacter scolyti* sp. nov.; and strain C, *Escherichia klebsiellaeformis* sp. nov.

4338. **CURRY, S. J. Ambrosia beetles.** *Rep. For. Dep. Kenya* 1954/55, 1957 (19).

Ambrosia beetles are widespread in Kenya forests at altitudes between 4000 and 10,000 ft., but occur in numbers such as to cause appreciable damage only between 4500 and 6500 ft. Exotic softwoods are apparently not attacked but > 40 indigenous species are susceptible after felling, 9 of these being also attacked when living, though only if diseased or unhealthy. Outstanding examples of this are *Olea welwitschii* and *Croton megalocarpon*.

4339. **SPAIĆ, I. Suzbijanje potkornjaka zatrovanim lovnim stablima.** [Control of barkbeetles by means of poisoned trap-trees.] *Šum. List* 80 (3/4), 1956 (86-101). 11 refs. [Croat.croat.g.]

[Cf. F.A. 14 Nos. 509-10.] Describes tests in 1955 on 44 Spruce, 20 Elm and 5 Ash trees, using Xylamon, Wolmanit and $ZnSiF_6$ pastes applied in a 2- to 3-mm. layer to the band-girdled portion of the stem. The trees were felled 8-10 days after treatment but before the swarming of the barkbeetles. Encouraging results (nearly 100% kill of insects, especially larvae) were obtained only with Spruce; the lack of success with Ash and Elm is not understood. With Spruce the effect of poison showed up to a height of 23-25 m. The author recommends the following widths of band-girdling: 5, 10 and 15 cm. for d.b.h. 20, 20-27 and 27-35 cm. respectively. For trees of 35 cm. d.b.h. and up, the effect of poison was uncertain, even with a band width of 20 cm.

4340. **HANSEN, J. E. Zu—Kann der Riesenbastkäfer *Dendroctonus micans* Kug. in Schleswig-Holstein erfolgreich bekämpft werden?** [A note on: 'Can *D. micans* be successfully controlled in Schleswig-Holstein?'] *Forst- u. Holzw.* 12 (10), 1957 (167-8). 1 ref. [G.]

[Cf. F.A. 18 No. 1901.] The author considers nutrient deficiencies to be the chief cause of susceptibility to beetle attack in Sitka Spruce, and reports on the application of N at the rate of 300 kg./ha. with the Ruhr-Stickstoff forest roller [cf. F.A. 18 No. 1588] in a seemingly moribund stand on poor sand with a thick raw-humus layer. Soil improvement was rapid, and all but two very heavily infested trees recovered and now after 4 years show healthy green foliage on new and 1- or 2-year-old shoots.

4341. **RÜHM, W. Eine neue Bekämpfungsmethode gegen den Riesenbastkäfer (*Dendroctonus***

micans Kug.) in Schleswig-Holstein. [A new method of controlling *D. micans* in Schleswig-Holstein.] *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie*, Berlin 1954, 1955 (52-5). [G.] I.I.E.

Sprays of 'Mobe T', a commercial BHC preparation, gave 100% control. Experiments proved that the preparation is not phytotoxic. Recommendations for its use are given. [Cf. *F.A.* 18 No. 1901.]

4342. STEVENS, R. E. Ethylene dibromide emulsion spray for control of the mountain Pine beetle in Lodgepole Pine. *For. Res. Note Calif. For. Range Exp. Sta.* No. 122, 1957. pp. 3. 2 refs.

Details of equipment, procedure, dosage and source of supply [cf. *F.A.* 16 No. 1995].

4343. CONDRASHOFF, S. F. Aerial reconnaissance of beetle-killed Ponderosa Pine, Aspen Grove area. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (1), 1957 (4).

Experiments demonstrated that groups of beetle-killed trees are not difficult to detect at altitudes up to 5500 ft. except when they occur in areas of severe winter injury. If aerial surveys of beetle-killed Ponderosa Pine are contemplated, they should be conducted at the time of year when most of the trees have recovered from the effects of winter injury and during periods of good visibility.

4344. Environmental factors affect beetle damage. *Rep. Calif. For. Range Exp. Sta.* 1956 [1957], (34-5).

Investigations since 1939 have shown that the most significant factors associated with mortality of Ponderosa Pine caused by *Dendroctonus brevicornis* are precipitation during the spring, soil moisture in mid-July, and average temperatures in April-July, and those associated with that caused by *Ips confusus* are precipitation deficiencies in April-July and the amount of breeding material left in areas logged in spring.

4345. KINGHORN, J. M. An induced differential bark-beetle attack. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (2), 1957 (3-4).

Data from this experiment show that *Trypodendron lineatum* attacks were induced on otherwise unsusceptible spring-felled trees by sawing logs into short lengths (16 in.). In the same manner, *Dendroctonus pseudotsugae* attacks were deterred. The reasons for these differences are not clear, but it is possible that the sapwood cells in the short blocks were killed rapidly thus giving rise to decomposition products different from those in long logs, in which the storage xylem cells probably remained alive for a relatively long period.

4346. CROOKE, M., and BEVAN, D. Note on the first British occurrence of *Ips cembrae* Heer (Col. Scolytidae). *Forestry* 30 (1), 1957 (21-8 + 2 photos). 11 refs.

During 1955 *Ips cembrae* was discovered in 29 localities in Moray, Nairn, Banff, and Inverness. These are the first British records for this species. It is assumed that it entered the country in post-war shipments of German timber and persisted in small numbers until the damage to woodlands caused by the gale in 1953 provided favourable conditions for

its increase. A conspicuous feature of attack is the twig tunnelling by the adult beetles which produces crown pruning. In one locality *I. cembrae* succeeded in breeding in, and killing, standing European Larch ca. 45 years old. *From authors' summary.*

4347. WICHMANN, H. E. Untersuchungen über *Ips typographus* L. und seine Umwelt. Asilidae, Raubfliegen. [*I. typographus* and its environment. Asilidae.] *Z. angew. Ent.* 39 (1), 1956 (58-62). 1 ref. [G.e.] O.H.

Describes observations, during an epidemic and a latency period of *Ips typographus*, on the preys of *Laphria gilva*, *L. flava* and *Machimus atricapillus*. None is considered effective in preventing the increase of *I. typographus*, but they may be of importance where beetle numbers are small. [Cf. *F.A.* 17 No. 3062.]

4348. Käferbefall verhindern! [Prevent beetle attack!] *Holz-Kurier*, Wien 12 (17), 1957 (16). [G.]

Describes methods, based on field trials, of controlling *Ips typographus* in stacked, unbarked roundwood with Forst-Viton (BHC) dust at 1.5-2.5 kg./10 cu.m., and its use in poisoning bark removed from trap or other trees, instead of burning it.

4349. SCHWERTFEGER, F. Scolytidae (Col.) an Pinus-Arten in Mittelamerika. I. Das Genus *Ips* De Geer. [Scolytids on Pines in Central America. I. The genus *Ips*.] *Z. angew. Ent.* 39 (1), 1956 (34-57). 13 refs. [G.e.] O.H.

Describes bionomics, ecology and distribution of 6 species occurring in Guatemala and Honduras. Only *Ips cribricollis* is considered of some importance as a pest; it occasionally attacked apparently healthy trees. A key to the beetles and their galleries is given.

4350. GARDNER, J. C. M. Note on the habits of two species of *Symmerus*, Platypodidae, in East Africa. *Emp. For. Rev.* 36 (2), 1957 (204-5). 1 ref.

Brief notes on the distribution and hosts of *S. montanus* and *S. tuberculatus*. Damage to *Olea welwitschii* by *S. montanus*, probably following a fire, is described. The trees recovered and the damaged wood was enclosed by new growth. The injuries were not extensive enough to affect the strength of the wood.

4351. AINO, S., YAMADA, F., and GOKAN, N. [Research on control measures against injurious insects that attack nursery stock—I. Ecological studies and chemical control of white grubs.] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 91, 1956 (1-36 + 6 photos). 32 refs. [Jap.jap.e.e.]

Tabulates catches of 33 species of Scarabaeidae in 8 nurseries from May to September and of their grubs through the seasons, vertically in the soil. *Anomala rufocuprea* (locally superseded by 3 other congeners) is dominant among adults and grubs, the latter being the most destructive nursery pest, with *Lachnosterna kiotensis* and 2 other *Anomala* spp. also important. Dusting with γ -BHC 1% at 2.5, 5, and 7.5 kg./1000 sq. m. resulted in the white-grub population (counts after 2 months) declining from 47.2% (control) to 13.2, and the number of dead

Chamaecyparis transplants from 13.1% to 2.1. The height growth of these at the 5 kg. rate was 3.3 times that of the untreated control. The 4 genera of coniferous transplants under test showed no toxic effects.

4352. LEIBUNDGUT, H. Recherches sur la sensibilité des jeunes fayards à certains insecticides employés pour combattre les hannetons et leur larves. [The effect on young Beech of certain insecticides used in the control of cockchafers and their larvae.] *Schweiz. Z. Forstw.* 108 (4/5), 1957 (258-60). [F.g.]

In view of injuries observed on mature Beech after cockchafer control measures, the effect of 6 insecticides (chiefly based on BHC) mixed into the soil in 4 concentrations, was tested on 120 four-year-old transplanted Beech wildlings. No significant differences in leaf discoloration, height growth or root development were apparent after 2 growing seasons, and it is concluded that these preparations, if mixed into the soil, are non-injurious to young Beech.

4353. COUTURIER, A., and ROBERT, P. Observations sur *Melolontha hippocastani* F. [Observations on *M. hippocastani*.] *Ann. Épiphyt.* 7 (3), 1956 (431-50). 15 refs. [F.] E.M.B.

A study based on observations in N. Alsace of behaviour in relation to habitat, the influence of the nature of the soil, and the length of the life cycle. Comparisons are also made with the behaviour of *M. melolontha*.

4354. HÚRKA, K. Experimentální undersøgelser over Oversvømmelse af den skovmaikæferungerlinge. (*Melolontha hippocastani* F.) [Experiments on the effect of flooding on *M. hippocastani*.] *Beiträge zur Entomologie, Berlin* 6 (1/2), 1956 (13-7). 10 refs. [G.]

Describes experiments in submerging larvae at various stages under different conditions, temperatures etc. A high % of 3rd-stage larvae survived a 10-days' submersion if surrounded by soil.

4355. HURPIN, B. Influence des conditions atmosphériques sur les sorties préalimentaires du hanneton commun (*Melolontha melolontha* L.) [The influence of atmospheric conditions upon the emergence for feeding of *M. melolontha*.] *Ann. Épiphyt.* 7 (2), 1956 (333-61). 19 refs. [F.f.] I.I.E.

A survey over a period of 6 years in different regions of France shows that the beetles emerge when the soil temperature at a depth of 25 cm. has attained 11° C. for 1-2 days, when the shrubs are in leaf and when the earliest Oaks and Beeches are flushing. Rhythm of emergence depends on weather, the requirements being an air temperature > 12° C. at mid-day, no rain, and a certain amount of sun.

Hymenoptera

See also No. 3931.

4356. MUJIN, K. Prilog poznavanju biologije *Dahlbominus fuscipennis* parazita *Diprion pini*. [The biology of *D. fuscipennis*, a parasite of *Diprion pini*.] *Zašt. Bilja* No. 35, 1956 (37-44). 4 refs. [Serb.serb.f.] I.M.I.

Observations on the life cycle of *D. fuscipennis* and the influence of nutrition on its development.

4357. BURNETT, T. Effects of natural temperatures on oviposition of various numbers of an insect parasite (Hymenoptera, Chalcididae, Tenthredinidae). Repr. from *Annals, Entomological Society of America, Columbus, Ohio* 49 (1), 1956 (55-9). 1 ref. B.A.P.

The relationship was studied of parasite density to parasite oviposition when various numbers of *Dahlbominus fuscipennis* were released among a constant number of cocoons of *Neodiprion sertifer* distributed over small plots on a grass lawn. Initially both the number of hosts parasitized and the number of parasite eggs deposited increased rapidly with increases in the number of parasites released. Above a certain density of parasites, parasitization increased more slowly. Superparasitization also increased as the number of parasites increased. There was an optimum density of adult parasites for maximum parasitization by the average ♀ of *D. fuscipennis*. As the temperature increased, the number of hosts parasitized and the number of eggs laid by a given number of parasites increased also. [Cf. F.A. 14 No. 518.] From author's summary.

4358. NESSENIUS, G. Zur Ökologie der kleinen Fichtenblattwespe, unter besonderer Berücksichtigung der oldenburgischen Verhältnisse. [The ecology of *Pristiphora abietina*, with special reference to conditions in Oldenburg.] *Forstwiss. Cbl.* 75 (11/12), 1956 (550-62). 33 refs. [G.g.]

A study was made in Oldenburg on the occurrence of outbreaks in relation to soils, stand density and climatic conditions. On the colder soils, warm and dry weather in April and May favours an increase in populations. Severity of attack seems to be related to age of the stand, pole-size and mature trees being constantly, but young regeneration only temporarily attacked. Losses of pupae are considerable. There is a definite relationship between ground-water level, depth of soil covering the cocoons, density of stocking, and date of emergence. Since the ♀s require a certain stage of the young growth for oviposition, any alteration in the date of emergence considerably affects the further course of the outbreak. There are also indications that the physiological condition of the trees has some influence on the development of the insect.

4359. MARTELLI, M. La *Pristiphora conjugata* Dahlb. (Hymenoptera Tenthredinidae) in Toscana. [*P. conjugata* in Tuscany.] *Redia, Firenze* (Ser. 2) 39, 1954 (157-85). 24 refs. [It.it.e.] I.I.E.

Gives an account of the *Pristiphora* spp. occurring in Italy, their distribution, hosts etc., and a detailed description of *P. conjugata*, life history, parasites, and suggested control measures, in Poplar plantations.

4360. DROOZ, A. T. The importance of *Mesoleius tenthredinis* Mor., a parasite of the Larch sawfly, in New York State. *J. econ. Ent.* 50 (2), 1957 (212). 3 refs.

Between 1909 and 1956 some 36 million *Larix decidua* and *L. leptolepis*, both susceptible to *Pristiphora erichsonii*, were planted in this State. In

the sawfly outbreak areas (Canadian prairies, Minnesota, and Wisconsin), host immunity has reduced parasitization by *M. tenthredinis* to about 5% but an instance is quoted where this species had parasitized 56% of 95 live larvae collected on Japanese Larch in New York State (outside the outbreak area).

459. Other Animals

See also Nos. 3967, 4206.

4361. BRAMMANIS, L. Om barrträdskvalstret (*Paratetranychus ununguis* J.) och dess bekämpande. [*P. ununguis* and its control.] Svenska Skogsvärdn. Tidskr. 54 (4), 1956 (411–21 + 2 photos). 10 refs. [Sw.g.]

4362. MARTIGNONI, M. E. Le tétranique tisserand de l'épicéa, *Paratetranychus ununguis* (Jacobi), un 'nouvel' ennemi de nos pépinières. [*P. ununguis*, a 'new' pest in Swiss nurseries.] Kurzmitt. Schweiz. Anst. forstl. Versuchsw. No. 6, 1955. pp. 3 + 4 photos. 4 refs. [F.] (Also available in a German version.)

Describes the biology of and injuries caused by the mite, recently reported on Spruce in Swiss nurseries, and control measures reported in the literature, all of which had the disadvantages of low toxicity for the egg stage and a short duration of efficacy.

46. Damage by Man

See also No. 3887.

4363. Pitch streak of Slash Pine. Rep. Stheast. For. Exp. Sta. 1956, 1957 (37).

This 'disease', confined to trees that have been tapped or wounded, results in elongated, dead but bleeding resin streaks above a dry face, is often lethal, and appears to be connected with the drought years in S. Georgia and N. Florida. It is more common on suppressed and intermediate than on dominant trees, on normal than on bark faces, and on trees with a low crown ratio.

4364. DEITSCHMANN, G. H., and HERRICK, D. E. Logging injury in Central States upland hardwoods. J. For. 55 (4), 1957 (273–7). 6 refs.

A series of logging studies were made in the Kaskaskia Experimental Forest, S. Illinois. The study area was divided into two parts: on (a) the felled trees were cross-cut before skidding, on (b) they were trimmed, topped and skidded full-length. The b.a. of the (a) plot was 71, and of the (b) plot 63 sq. ft.; the volume for (a) averaged 6500 bd. ft./acre, of which half was harvested, and for (b) 3900 bd. ft., of which 1600 bd. ft. were harvested. Three diesel-powered, crawler tractors were used, of 32, 43, and 66 h.p., and 4 types of attachments tested, viz. butt hook, winch, winch and skidding pan, winch and rubber-tyred sulky or arch. On (b) the 32-h.p. tractor was not used. Bunching logs caused less frequent and less severe injury than bunching whole trees. The area disturbed by bunching on (a) was greatest for the largest tractor and least for the medium-sized one. The area disturbed in bunching was significantly smaller with all tractors when a sulky or arch was used. The

number of trees injured along skidding trails increased with the size of the tractor. Log-length and tree-length skidding differed very little in their influence upon the general level of stocking of the residual stand.

48. Injuries Due to Unknown or Complex Causes

See also Nos. 3771, 3990, 4205.

4365. BOURCHIER, R. J. Red belt, *Atropellis* canker, and tree mortality of Lodgepole Pine in Alberta. Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can. 13 (2), 1957 (2–3).

Severe reddening of Lodgepole Pine foliage was evident on hilltops in west-central Alberta in 1954, the symptoms being those of the well-known red-belt disease due to climatic causes [cf. F.A. 13 No. 3941]. The stands in this area are heavily affected with stem cankers associated with *Atropellis piniphila*, and the effect of red-belt on these stands was investigated. The evidence indicates that heavy tree mortality may occur in severely cankered stands after they have been severely affected by red-belt. The probable importance of delayed tree mortality in stands suffering from other disorders should be stressed in appraisals of red-belt damage. Similarly, susceptibility of *Atropellis*-infected stands to injury by red-belt should be considered in evaluating damage caused by this canker.

4366. ROTH, E. R., and COPELAND, O. L. Uptake of nitrogen and calcium by fertilized Shortleaf Pine. J. For. 55 (4), 1957 (281–4). 3 refs.

Eight replicated plots of $\frac{1}{20}$ acre were established in 1946 in S. Carolina in a 30-year stand of *Pinus echinata* in which some trees had littleleaf disease, and the following fertilizer treatments were applied to each: $(\text{NH}_4)_2\text{SO}_4$, NaNO_3 , NaNO_3 + gypsum, Milorganite (6% N), gypsum, KCl, and leafmould. Control plots were left untreated. Similar replicated plots were established and the same treatments applied in 1947 to a 15-year-old stand in which littleleaf had not yet appeared. All plots were re-treated after 3 years. The N content of the F-layer and of the surface soil was analysed 3 years after treatment and one year after the second fertilizer application. The N and Ca content of the current year's needles was also analysed one year after treatment, on healthy and diseased trees. Where fertilizer with a large amount of N was applied, the N content of the foliage increased significantly in all trees, and diseased trees showed signs of recovery after one year. The addition of gypsum, KCl or leafmould had no effect on the N content of the needles. Uptake of Ca increased only on plots treated with gypsum. [Cf. F.A. 13 No. 1411.]

4367. Pole blight of Western White Pine. Rep. Intermt. For. Range Exp. Sta. 1956, [1957] (23–5).

(1) Conclusions from an analysis of data from root and soil studies were that: (a) Root deterioration is pronounced in both healthy and diseased parts of diseased stands and tends to increase with an intensification of blight. (b) Rootlet density decreases and rootlet mortality increases as the affected basal area increases. (c) Greater effective

soil depths and available water-storage capacities are associated with lower rootlet mortality, higher rootlet density and less pole blight. (d) Rootlet mortality in the upper 3 ft. of soil is about $2\frac{1}{2}$ times greater in diseased stands on hardpan soils, and 3 times greater in those on rocky soils than in healthy stands on good soils. (2) A study begun in 1955 on the effects of artificially imposed drought on 90-year Pine was expanded. Additional soil-moisture plots were established in old healthy and young healthy stands and in diseased and healthy stands on rocky soils. An experiment was begun on the effect of moisture stress on root development of seedlings of Western White Pine and 4 other conifers on hardpan, and on rocky and good soils. (3) In 1 acre of a pole-blighted stand: (a) Mortality of both rootlets and root tips of Western White Pine was $\frac{1}{2}$ or less that of rootlets and tips of Western Hemlock, Western Larch, Grand Fir, Western Red Cedar, Douglas Fir and Lodgepole Pine, and slightly above the mortality of rootlets and tips of Engelmann Spruce. (b) For roots in the upper 1 ft. of soil, Grand Fir, Hemlock, Spruce and Cedar had significantly higher root-tip quotients (root tips per unit length of root), greater numbers of rootlets per unit length of root, and greater ratios of length of fine root (< 1.0 mm. diam.) to length of structural root (1.0–5.0 mm. diam.) than White Pine, Larch, Lodgepole Pine and Douglas Fir; of these last 4, White Pine appeared to be the least able to compete for moisture on the basis of root system alone.

4368. 'Spindle stand' of Pines. *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (18).

Pot experiments have been completed on the possible causes of 'spindle stand' in *Pinus radiata* growing in Young sand from Mount Burr. The unthrifty appearance could not be improved by providing more water, more mycorrhiza, or more needle litter, or by eliminating possible toxic factors. Vigorous, healthy Pines could be obtained by applying fertilizers containing N, P, S, K, Zn, and Cu. The addition of 50 other elements produced no further beneficial effects after a year. It is thought that 'spindle stand' may be due to a multiple deficiency of essential elements, and it is doubtful whether it would be economically sound to apply fertilizers and establish Pine on such a deficient sand.

4369. BECKWITH, L. C., and ANDERSON, R. L. Boxelder blight a problem in the Northern Plains states. *Tech. Note Lake St. For. Exp. Sta.* No. 482, 1957. pp. 2.

Notes on a blight of *Acer negundo* seedlings, now widespread in N. Dakota. Small chlorotic leaves form on the new shoots, and growth is checked; no tree mortality has been observed. Causes of the disease are unknown; a leaf-boring insect has been found in association with it.

4370. BERBEE, J. G. Virus symptoms associated with Birch dieback [in *Betula papyrifera* and *B. lutea*.] *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (1), 1957 (1).

Intensive study of affected trees revealed many symptoms that seemed typical of virus disease, so a

wide variety of transmission trials have been set out. Results to date show promise: an infectious agent has been transmitted by grafting from typical dieback trees with virus-like symptoms to previously healthy seedlings and mature trees. The possibility of transmission by seed is also being tested.

4371. ŽUFA, L. O zdravstvenom stanju cerovih sastojina u šumama Kozara—Šušnjar, Štrbac i Breška Šuma severozapadne Bačke. [The state of health of *Quercus* cerri stands in the forests of Kozara—Šušnjar, Štrbac and Breška Šuma, in N.W. Bačka.] *Šumarstvo* 9 (4/5), 1956 (245–50). 3 refs. [Serb.e.f.]

Data on stands of *Q. cerris* between 33 and 104 years old show that a large number of trees have canker infections caused by *Poria obliqua*, cracks caused by frost, or are stagheaded. The percentage of stagheaded trees rises to 40–50% among the older trees. Reasons for poor vigour are unsuitable soil and unfavourable temperatures. The soil is heavy clay-loam with an alkaline reaction, and temperatures vary from -25° to $+35^{\circ}$ C. Conversion to frost-hardy species, e.g. *Quercus robur*, is recommended.

4372. GILLESPIE, W. H. Recent extensive mortality of Scarlet Oak in West Virginia. *Plant Dis. Repr.* 40 (12), 1956 (1121–3). A.P.B.

The unexplained disease of *Quercus coccinea* in W. Virginia (mainly Pocahontas County) is characterized by rapid browning and dying of the foliage and, frequently, the death of the affected trees. Short notes are presented on the distribution of the disease, its symptoms and economic importance.

4373. SILVERBERG, S. B., and BRANDT, R. W. Association of *Cytophoma pruinosa* with dying Ash. *For. Sci.* 3 (1), 1957 (75–8). 4 refs.

A study of this disease leaves it still uncertain whether *C. pruinosa* is (a) a primary, or (b) a secondary cause. In favour of (a) are the facts that the fungus has been consistently isolated from affected trees, that stems of 1–3 in. and branches < 0.75 in. in diam. have been successfully inoculated, and that the fungus has been consistently recovered from the resulting cankers. In favour of (b) are the failure to inoculate successfully stems of ≥ 4 –6 in. diam. and the fact that there had in many cases been a decline in vigour, shown by reduced diameter increment, before symptoms of disease appeared.

4374. GARREN, K. H. Possible relation of *Diplodia theobromae* to leader dieback of Sweetgum suggested by artificially induced infections. *Plant Dis. Repr.* 40 (12), 1956 (1124–7). 8 refs. A.P.B.

D. theobromae was isolated from Sweetgum with leader dieback in the southeastern U.S.A. and a *Diplodia* sp. from trees with Sweetgum blight in Maryland. Wound inoculations with *D. theobromae* induced dieback and cankers on young Sweetgums grown in a low-mineral medium and also on young vigorous Sweetgums on which the micro-environments of inoculated areas were kept hot and humid. In such micro-environments, trees with induced cankers also developed dieback. From author's summary.

4375. JOHNSON, T. W., Jr., et al. **Observations on Yellow-Poplar dieback.** *For. Sci.* 3 (1), 1957 (84-9).

A 2-year study associates this mortality in vigorous *L. tulipifera* up to 8 in. d.b.h. with 3 sporulating and several non-sporulating fungi and with *Xanthomonas* sp. (undetermined), all found in the cankers. Site factors and severe competition may be contributing causes.

4376. BENITO MARTÍNEZ, J. Las formaciones tumorales, de tipo 'crown-gall', en los eucaliptos cultivadas en España. [The formation of a 'crown-gall' type of tumour on Eucalypts cultivated in Spain.]

[*Bol. Inst. for. Invest. Exp. Madrid* 28 (76), 1957. pp. 26 + 6 plates. 25 refs. [Span.f.e.g.]

A histological study was made of tumours appearing at the root-collar of *Eucalyptus globulus* in Spain, and attempts at cultures were made. These however proved negative. Tumours at the collar were induced by inoculation with paste of unbarked tumours or with small pieces of unbarked tumour on the stem, 10 cm. above soil level. Investigations made in Australia on lignotubers of Eucalypts are reviewed. The theory that these are normal formations does not fit in with the appearance outside Australia of the crown-gall type of tumour, the origin of which remains obscure.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

4377. KER, J. W., and SMITH, J. H. G. **How much and how fast—forest measurements today. Parts I & II.** *B.C. Lumberm.* 41 (2-3), 1957 (30... 34; 94... 102). 50 refs.

Reviews with 50 references the position in N. America under: transport, statistical and computational procedures, instruments and aids, aerial photos, volume and yield tables, textbooks, lag of practice behind research, cruising, site quality, decay, regeneration, measurement and prediction of growth, extension in the field of proved techniques, and testing, demonstration and development of methods.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

521. Diameter (Girth) and Sectional Area

See also Nos. 4383, 4385, 4400, 4407, 4412.

4378. NYSSÖNEN, A. Hakkuumäärän arvioiminen kannoista. [Estimation of the cut from stumps.] *Commun. Inst. for. Fenn.* 45 (5), 1956. pp. 68. 56 refs. [Fi.f.e.e.]

Discusses determination of the age of stumps from their state of decay and the vegetation on them, signs on neighbouring trees, and the (doubtful) evidence of the pattern of annual rings; the relation of diameter at ground level to d.b.h.; differences of height and taper between trees removed and remaining, etc. Estimates, where compared with the results of actual measurement, were generally somewhat too low, but on the whole satisfactory for about 10 years after cutting in the South and longer in the North. Sampling density to estimate cuts from stumps over large areas should be about 3-4 times that for estimating growing stock in order to obtain the same degree of accuracy. *From author's summary.*

4379. BELL, J. F., and ALEXANDER, L. B. **Application of the variable plot method of sampling forest stands.** *Res. Note Ore. Bd. For.* No. 30, 1957. pp. 22.

A paper designed for the practising forester who is interested primarily in the use of the angle-count technique for cruising and other inventory work.

There is an appendix on the theory of the variable-plot method of sampling a forest stand.

4380. STRAND, L. Litt om bruken av relaskopet. [Notes on the use of the relascope.] *Norsk Skogbr.* 3 (9), 1957 (255-7). [Nor.e.]

Discusses the accuracy of the relascope in estimating volume and increment, and the improvement gained by finding a correction factor from the difference between relascope and caliper measurements on a proportion of the plots measured.

4381. BRISCOE, C. B. **Calibration of the wedge prism.** *L.S.U. For. Note La. agric. Exp. Sta.* No. 14, 1957. pp. 2. 2 refs.

Gives a table of basal-area conversion factors for a wedge prism used in plotless cruising [cf. *F.A.* 16 No. 4371].

4382. GROSENBAUGH, L. R., and STOVER, W. S. **Point-sampling compared with plot-sampling in Southeast Texas.** *For. Sci.* 3 (1), 1957 (2-14). 5 refs.

A comparison is made of estimates, by two methods, of b.a. and volume (cu. ft. and bd. ft.) per acre, derived from 665 samples taken by the same field parties over 12 counties, in places where slope rarely exceeded 10%. The methods were (A) point sampling with a calibrated commercial-type 104·18-minute wedge prism (3·03 dioptries) from the centres of the ¼-acre circular plots (2 plots 5 chains apart at each intersection of the 3-mile National grid) of the standard U.S. forest service procedure, and (B) ordinary enumeration of the same plots. Detailed statistical analyses are presented to show that (A) differs from (B) only to an extent easily explained by sampling variation or chance, provided that specified precautions are taken. With method (A) it might be better to sample at 3 points per grid intersection. The data are of local application but a general trend, is indicated. (A) is cheaper in time (data given) and labour (one-man crew).

522. Height, Length

4383. BITTERLICH, W. Die Weiterentwicklung der optischen Zählmessung in der Bestandesaufnahme. [Further developments in stand mensuration based on optical counting.] *Allg. Forstztg.* 66 (15/16), 1955 (185-6). 1 ref. [G.]

(1) In Hirata's method of finding mean height (h_m)—a further application of Bitterlich's angle-counting—a circular sweep is made with an instrument sighted at a constant angle of elevation (β) and a count made of all trees (z) whose tops project above the line of sight [cf. following abstract and F.A. 18 No. 713]. If the number of trees/ha. (n) is known, and the ground is level,

$$h_m = 100 \cdot \tan \beta \cdot \sqrt{\frac{z}{n \cdot \pi}},$$

and when

$$\tan \beta = \sqrt{\pi} \text{ (i.e. } \beta = 60^\circ 34'), h_m = 100 \cdot \sqrt{\frac{z}{n}}.$$

The mathematical proof is given briefly.

(2) Another application, proposed by the author himself, obtains mean stem form from readings taken with an improved mirror relascope using a sighting angle (a) corresponding to a count-divisor of 4, and provided with a scale giving relative heights as multiples (10, 20, 30 . . . 70) of the d.b.h. At each observation point in the stand: (i) a normal angle count is taken, trees ≥ 14 cm. in d.b.h. being simultaneously calipered and tallied; (ii) on each stem counted, a reading is taken of the relative height at which its diameter subtends a ; and (iii) h_m is found by Hirata's method. The data from (i) are used to find b.a./ha., mean b.a./tree, n , and the sampling intensity. The numbers of trees (by species) counted in (ii) as subtending a at one or other of the relative heights, are subtracted successively for each height from the total counted, each result is divided first by 4 to give sectional area/ha. and then by n to give the corresponding sectional area of the mean tree, at that height. It remains only to convert relative to absolute values by multiplying the mean d.b.h. (known from (i), which includes calipering as the only measurement in absolute values) by the appropriate factors, and to complete the mean stem profile with h_m from (iii).

4384. HIRATA, T. [Height estimation through Bitterlich's method—vertical angle-count sampling.] *J. Jap. For. Soc.* 37 (11), 1955 (479–80). 4 refs. [Jap.e.]

Briefly explains the author's method of finding mean height [cf. preceding abstract].

4385. BITTERLICH, W. Die Relaskopmessung in ihrer Bedeutung für die Forstwirtschaft. [Measurements with the Relascope and their importance for forestry.] *Öst Vjschr. Forstw.* 97 (2), 1956 (86–98). 55 refs. [G.]

The first part reviews further applications of the principle of relative angles and briefly describes instruments developed in connexion with it, including the *Tarifmesswinkel*, a calipering fork equipped with various scales for direct reading of basal areas and volumes, and an optical 'caliper' (not yet in commercial production) consisting essentially of two parallel mirrors, a sighting hole, and a scale, which, together with a relascope, allows fairly accurate measurements of the tree diameters counted at various stem heights, to be made in combination with the taking of an angle-count sample. Describes also Hirata's method of finding mean

height, and the author's own method of finding mean stem form [see preceding abstracts]. The second part reports on a test of these combined methods, shortly called the B–H system of measurement, from 44 regularly spaced grid points in 11.5 ha. of mixed forest (chiefly Spruce, Fir and Beech). Apart from the time taken in constructing the grid, two graduate foresters and one assistant took 11 hours to obtain the following data: (1) b.a., (2) stem numbers, (3) mean heights, (4) diameters at 1-m. intervals up the stem, (5) artificial form factors, (6) volume, ascertained in 1-m. sections, the top portion above the last available diameter being computed, as a reasonable approximation, as the product of the last sectional area and half the remaining mean height. Finally, sampling intensity was ascertained by reference to the basal area of the counted stems, and found to be 8.97%. In (1) and (2), five species are distinguished, in (3)–(6), three, and in (1)–(4), two crown classes are, in addition, shown separately.

4386. PRODAN, M. Die wichtigsten Baumhöhenmesser. [The most important tree hypsometers.] *Forstarchiv* 28 (5), 1957 (111–2). [G.]

Deals briefly with 7 geometric and trigonometric hypsometers. Most accurate results are given by the latter, of which the Blume-Leiss and Haga makes are recommended. Prices are given.

4387. LUNDQVIST, B. Om höjdtvecklingen i kulturbestånd av tall och gran i Norrland. [Height development in Pine and Spruce plantations in Norrland.] *Medd. SkogsforsknInst., Stockh.* 47 (2), 1957. pp. 64. 16 refs. [Sw.e.] Price Kr.3.

Material from 68 sample plots has been used to construct tables and graphs showing the height of dominant trees at different ages. Methods used, and the use and applicability of the results are discussed.

523. Bark

See No. 4392.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See Nos. 4383, 4385, 4390–4, 4436, 4451.

524.3. Volume of Tree Groups and Stands

See also Nos. 4057, 4385, 4406, 4447.

4388. OHTOMO, E. A study on preparation of volume tables. *J. Jap. For. Soc.* 38 (5), 1956 (165–77). [E.e.jap.]

Discusses the rejection of extreme values in the regression analysis, testing the value of the volume table, and testing the regression constant and coefficient.

4389. KOSONOGOV, P. Tarife Algana i Šefera i mogućnost njihove primene u našim uređajnim radovima. [The 'tariffs' of Algan and Schaeffer and the possibility of their application in Yugoslav forest management.] *Šumarstvo* 9 (10), 1957 (623–35). 9 refs. [Serb.]

Discusses theoretical bases and practical application with examples of the volume tables (tariffs) of Algan and Schaeffer [cf. *F.A.* 11 No. 749].

4390. KOSONOGOV, P. Istraživanja oblika i zapremine belog jasena u Ravnome Sremu. [Investigations on the form and volume of *Fraxinus excelsior* on the Srem plains.] *Šumarstvo* 9 (3), 1956 (163-84). 1 ref. [Serb.]

A detailed defence of the author's original article criticized by Mirković [see *F.A.* 17 No. 689].

4391. PETRESCU, L. Contribuții la studiul formei popilor negri hibridi. [Contribution to the study of the form of hybrid Black Poplars.] *Rev. Pădurilor* 71 (6), 1956 (382-3). [Rum.]

In pursuance of his studies on the form of 'Canadian' Poplar [cf. *F.A.* 18 No. 1955] the author presents a table of form quotients.

4392. RÄTZEL, K. Untersuchungen über Inhalt und Form, sowie die Beziehung zwischen Krone und Zuwachs bei der Pappel. [Volume and form of Poplars, and the relation between size of crown and increment.] *SchrReihe bad. forstl. VersAnst.* No. 10, 1955, pp. 84. 33 refs. [G.g.]

The main part of this study is based on 1452 stems, mostly from stands in the flood-plain of the Rhine between Karlsruhe and Speyer, divided by habit into a *marilandica* (*M*), a *robusta* (*Ro*) and a *regenerata* (*Rg*) type. Tables include, for *M* and *Ro*, form factors, volume of wood > 7 cm. diam., bark thickness and bark %, log volumes by length from butt and 4-cm. diameter classes, and, for all 3 types, true and artificial diameter-quotient series, showing greatest taper for *M* and least for *Ro*, with *Rg* close to *M*. Diameter and b.a. increment increased with increasing crown surface, values for *M* being consistently higher than for *Ro*.

4393. CSISZÁR, I. Fatómégtáblák szerkesztése. [The construction of Poplar volume tables.] *Erdész. Kutatás.*, Budapest 1955 (4), (15-29 + smries in suppl.). 8 refs. [Hu.russ.e.g.]

Discusses the relations of form factor (f.f.) to diameter and height, using 1108 *Populus alba* and *P. canescens* (5-70 cm. diam.), 147 *P. nigra* (10-50 cm.) and 231 *× P. marilandica* (5-30 cm.). Provisionally a general f.f. of 0.48 is suggested for the White and Grey Poplars. For a reliable table 25 representative stems should be analysed. *P. nigra* and *× P. marilandica* had f.f.'s respectively 6.8-11.2 and 13-14% below that of *P. alba* and *P. canescens*. From author's summary.

4394. HENRIKSEN, H. A. Die Holzmasse der Buche. [Volume of Beech.] *Forstl. Forsøgsv. Danm.* 21 (2), 1953 (138-214). 19 refs. [G.dan.]

Discusses the concept of the 'volume plane', a 3-dimensional system expressing the relationship of height, diameter and volume of stands, as contrasted with the volume line, in constructing volume tables and determining stand volume.

4395. FOG, D., and JENSEN, A. General volume table for Beech in Denmark. *Forstl. Forsøgsv. Danm.* 21 (2), 1953 (93-137). [E.dan.]

Presents a volume table and discusses its use and the materials and methods used in its preparation.

4396. ERASLAN, I. Demirköy ilçesi meşe ormanlarında hacim ve hasilat araştırmaları. [The volume and yield of Oak forests in the Demirköy District, Thrace.] *Istanbul Üniv. Orm. Fak. Derg.* 5 A (1/2), 1955 (45-72). 31 refs. [Turk.g.g.]

Data based on 58 plots are presented for unthinned, normally stocked, even-aged, pure Oak coppice, which is the most important local type, occupying nearly 400,000 ha. (71%) of the forests of Thrace. The tables cover single-tree volumes (d.b.h. 6-46 cm., total height 4-26 m.), % of different assortments (pitwood, logs, and fuel from lop and top); bark % for the same diameter range and assortments; and yield tables (5 site classes, 5-100 years) for total volume and assortment volumes.

4397. TAKASE, G. [On the term of height in the volume formula consisting of three variables, especially in the volume table of Kunugi (*Quercus acutissima* Carr.).] *J. Jap. For. Soc.* 38 (6), 1956 (213-5). [Jap.jap.e.]

Compares four volume formulae introducing the factor height in various ways, with a numerical and statistical test of the constants for the most promising.

4398. MYERS, C. A. Cubic-foot volume table for immature Ponderosa Pine in the Black Hills. *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 25, 1957, pp. 2. 2 refs.

From measurements of 248 trees, a table is given for diam. classes from 1 in. to 19 in. inclusive.

4399. CROMER, D. A. N., and CARRON, L. T. Stand volume tables with particular reference to *Pinus radiata* in the A.C.T. *Bull. For. Timb. Bur. Aust.* No. 35, 1956, pp. 19. 10 refs.

The use, and methods of compilation, of stand volume tables are discussed.

An investigation of stand volume tables for *P. radiata* in the Australian Capital Territory is described. The main study was restricted to compilation by equations incorporating b.a./acre, an expression of total height, and the product of these two, as independent variables. Suitable equations were derived by linear regression for two plantation areas; statistical tests of the equations against the compilation data are given. The equations were then tested against independent data comprising yield and spacing plots, the volumes of which were derived by the sum of individual tree volumes read from a volume table. The most efficient estimate of volume was given by the equation incorporating the three independent variables in conjunction (Australian equation). A less efficient but satisfactory and practical estimate for assessment purposes was given by a simple regression of the form $Y = a + bX$ where Y is volume per acre and X is the product of b.a./acre and height (combined variable equation). It is suggested that this simple equation might be used to great advantage in yield and experimental-plot work where the mean volume of several plots in a category (e.g. site index, spacing) is required. Authors' summary.

524.4. Recording of Data. Organization of Measuring Parties and Their Work

4400. **Forest Surveys and Inventory Division sampling manual.** British Columbia Forest Service, Victoria, B.C. 1956. pp. 340 + 9 plates.

Contains the following sections: (1) Duties of the sampling party; (2) inventory sampling (design, shape, location etc. of plots; mapping, different intensities of sampling; use of Relascope; standards; charts); (2A) operating cruises and valuation (office preparation; field work; mapping; integration of data); (3) decay analysis; (3A) local volume and decay studies; (4) volume analysis; (5) photogrammetry; (6) felling and barking agreements. The appendices include a number of tally sheets, report forms, site-index curves, and age/height factors.

4401. **Forest Surveys and Inventory Division forest classification manual.** British Columbia Forest Service, Victoria, B.C. 1957. pp. 220.

Part I defines the items to be tested on the code sheet or standard form used in describing forest types systematically; part II gives miscellaneous information (general rules on typing, cruise techniques, revision and description of compartments etc.); part III gives notes on photogrammetry, and part IV on classification from air reconnaissance; part V deals with 'type lists' and use of age and height classes. The appendices include a number of code sheets (for ground and air work), charts, site-index curves and tables of stump-age/total-age correction factors.

4402. **Forest Surveys and Inventory Division tabulation manual.** British Columbia Forest Service, Victoria, B.C. 1956. pp. 70.

Covers the preparation of punched cards and the use of tabulating machines for preparing survey statistics, including analysis of sample data, and preparation of volume tables and cull tables. There are numerous examples of punched cards, tally sheets etc.

4403. RUDOLPH, V. J., and SHERRILL, B. C. **Field key-punching of forestry data.** *J. For.* 55 (5), 1957 (377-8). 3 refs.

Discusses the use in the field of a portable key-punching machine for recording data. Its advantages over other methods are speed and accuracy, and a large number of items can be recorded on one card [cf. *F.A.* 18 No. 3170].

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 3831, 4379-82, 4383, 4385, 4400.

4404. BERGEROO-CAMPAGNE, B. **Technique suivie en Côte d'Ivoire pour les inventaires en forêt dense. [A method of enumeration applied in dense forest in the Ivory Coast.]** *Bois For. Trop.* No. 52, 1957 (2-8). [F.span.e.]

Describes a quick, cheap method of making enumerations with a view to determining the areas suitable for (a) natural regeneration, (b) enrichment

with valuable species. The whole area is divided into 1-km. square compartments, which are subdivided. Topographical features are sketched on a scale of 1 : 5000, and another map on the same scale, on tracing paper, is made to show enumeration data and to be used as an overlay to the topographical map. Costs are only 2-3 man-days/ha.

4405. HOLLOWAY, J. T. **The national forest survey and the watershed protection forests [of New Zealand].** *N.Z. J. For.* 7 (3), 1956 (61-7).

With completion of assessment survey of lowland indigenous commercial forests, surveys of highland watershed protection forests are to be undertaken. The field of work, objectives, and proposed survey and research programmes are briefly outlined. In short, a triple attack on outstanding problems is proposed. Firstly, detailed reconnaissance surveys to define the problems; secondly, establishment of permanent reference points, by periodic re-assessment of which all trends in the condition of forested watersheds may be judged; and thirdly, fundamental research along lines dictated by the results of surveys. *Author's summary.*

4406. SCHUT, H. W. **Perkembangan penentuan isi kayu dalam hutan^a yang bertumpang di Indonesia. [Determination of volume in mixed virgin forests, as developed in Indonesia.]** *Rimba Indonesia* 6 (1/2), 1957 (3-34). 6 refs. [Jav.Due.]

Early surveys based on scattered strips < 1 km. in length proved unsatisfactory; from 1930, strips several km. long have been used with good results. In 1948-52 all trees over 35 cm. d.b.h. were measured for diameter and height of clear stem, and the volume was calculated, using a form factor of 0.7, on 4000 ha. of long strips 10 or 20 m. wide. The method can be simplified by excluding, or reducing the number of measurements on, trees < 55 cm. d.b.h. and by using volume tables. Tables compiled by the method proposed by Dawkins [see *F.A.* 15 No. 3865] and based on data from ca. 35,000 trees felled at various times for herbarium material. show the correlation between d.b.h. and volume of the clear bole for over 30 species and the volume per stem for 10 *Shorea* spp. in diameter classes 40-100 cm.

4407. BARTON, J. D., JR. **Comparison of four forest sampling techniques.** *Abstr. of thesis, in Dissert. Abstr.* 17 (4), 1957 (729). O.R.S.

The 4 methods studied were those using quadrats of 3 sizes ($\frac{1}{40}$, $\frac{1}{16}$, and $\frac{1}{8}$ acre), strips 602 × 25 ft., quadrants, and the variable radius (Bitterlich) method, as applied to the determination of density and basal area per acre, in a 20-acre natural population of trees with d.b.h. > 4 in. in a virgin stand dominated by *Quercus alba*, *Fagus grandifolia* and *Acer saccharum*. The % standard error decreased with increasing quadrat size and density or b.a. Sampling was better for density than for b.a. by the area methods, except for the 3 most abundant species by the strip method; the Bitterlich method sampled b.a. better than density. The 'field efficiency' of the methods was assessed from the number of sample units, acres, trees, and time,

required to give a 15% standard error. Strips proved most, and $\frac{1}{40}$ -acre quadrats least, efficient in determining density, and variable radius most, and $\frac{1}{40}$ -acre quadrats least, in determining b.a.. The use of the 't' test for bias among species and methods gave little evidence of bias for density or b.a. determination by $\frac{1}{8}$ -acre and $\frac{1}{40}$ -acre quadrats and the Bitterlich method.

4408. PRODAN, M. Zur Durchführung von Repräsentativaufnahmen. [On the practice of representative sampling.] *Allg. Forst- u. Jagdztg.* 126 (5/6), 1955 (117-23). 2 refs. [G.e.]

The author discusses the applicability and adaptation of statistical sampling to Central European conditions, where fairly accurate information on small units is needed and little homogeneity over larger areas can be assumed. He presents simplified approximation formulae for arriving at sampling intensities giving a S.E. of $\pm 5\%$. These he bases on diameter relationships, chiefly in even-aged stands, and presents tables giving approximate coefficients of variation based on either maximum and minimum diameters, mean diameters only, or age. For small areas he arrives at the formula $n = c_a^2$ where n is the number of stems to be measured and c_a the coefficient of variation of the diameters. The formula is worked out in a table for areas up to 20 ha. for various stand densities and coefficients of variation. Questions of sample-plot size, of the use of angle-count methods, the traditional methods of full enumeration and ocular estimation and their suitable combination, are discussed from the technical and financial standpoints.

4409. GROSSMANN, H. Genauigkeitsuntersuchungen über die in der DDR angewandten mathematisch-statistischen Holzvorratsaufnahmen. [The accuracy of the method used in East Germany for statistical sampling of the growing stock.] *Arch. Forstw.* 5 (5/6), 1956 (402-22 + 13 tbls.). 9 refs. [G.g.]

Using b.a. data from 4-acre plots at 1 or 2 per ha., covering 5 management units, 19 *Oberförstereien* and 128 ranges (containing 91,300 ha. with 12.9 million cu.m. of timber), the probable limits of sampling accuracy and the coefficients of variation are calculated for each of the 128 ranges and of their administrative groupings. The 12 blocks used in the variance analysis cover stand types (blanks, regeneration, pole and tree crops etc.) separately for coniferous, broadleaved, and mixed stands. The effects of species and diameter classes call for further work. Tables show for the two sampling intensities the increasing reliability of sampling as area extends, or volume/ha. increases, and the number of plots required for a sequence of desired levels of accuracy is also tabulated. At 2 plots/ha., the accuracy of complete caliperage was attained, with much reduced cost, at range level (294-1170 ha.). It is claimed that since all growth regions are represented in the populations studied, the means of the tables are of general application in Eastern Germany.

4410. ŽUFA, L. Rubna stabla primernih površina. [Border trees on sample plots.] *Šumarstvo* 9 (10), 1956 (613-22). [Serb.e.f.]

From data on border trees of sample plots [population not stated] graphs are given showing the relation of the number of such trees to length of perimeter for sample plots of different shapes and areas. The b.a. of border trees, in % of that of the stand, averaged $2.84\% \pm 1.08\%$ for the data analysed. As the value will usually be less than this, and in view of the magnitude of other, unavoidable, errors, the effect on volume estimates will not be considerable.

4411. GÜDE, H. Optische Aussteckung von Kreisprobestflächen mit horizontaler kreisrunder Basislatte. [Optical demarcation of circular sample plots with a horizontal circular strip at the centre.] *Allg. Forstztg.* 66 (15/16), 1955 (187-9). 9 refs. [G.]

Sights are taken over a simple instrument having sighting points 2 cm. apart and held at arm length, at a circular strip of metal or stiff paper suspended horizontally at eye level, e.g. from a stick placed in the centre of the proposed plot. Formulae and tables for ascertaining the radius of the circle are given for various sizes of sample plot and varying distances between observer's eye and instrument, and to adjust for slope. A mirror Relascope with its fixed distance between sights and eye and automatic adjustment for slope, would simplify operations even more.

525. Volume by Assortments. Merchantable Volume

See also Nos. 4396, 4400, 4443, 4454, 4489-91, 4735.

4412. HOWARD, M. C. Classified basal area. *J. For.* 55 (4), 1957 (302).

Suggests dividing b.a. to show its diam.-class distribution. Given diam. classes of 2-4, 6-10, 12-18 and 20-28 in. corresponding to saplings, poles, small and medium sawtimber, with X to represent unknown or unmeasured area and T for values < 0.5 sq. ft., then a classified basal area (c.b.a.) of $X-T-50-70$ (120), indicates a stand of 120 sq. ft. with no saplings, < 0.5 sq. ft. of poles, 50 sq. ft. of small and 70 sq. ft. of medium sawtimber.

4413. LASSEN, J. Højdelagsundersøgelser i bøg. [Research on [distribution of volume and value with] height in the stem in Beech.] *Dansk Skovforen. Tidsskr.* 40 (11), 1955 (503-13). [Dan.]

Sample trees were felled and laid off in 4-m. lengths (0-4, 4-8, 8-12 and > 12 m. from the base) and the value of each section was assessed as a % of total value. Results were compared with some similarly obtained in 1930. The 20% increase in the proportion of usable timber in the 1954 results is due (1) to the inclusion of a new assortment, viz. flooring timber, in this category, and (2) to the relaxation of standards as regards red heart. The volume % [of total stem volume?] remains fairly constant—22% in 0-4 m., 18% in 4-8 m., 16% in 8-12 m. and 44% in > 12 m. The value % has changed, 10% shifting from over to under 12 m., distributed fairly evenly among the 3 height divisions under 12 m. Prices/cu.m. and the price range within assortments have

increased considerably since 1930. In 1954, in well pruned trees, 61% of the value is in the lowest 8 m., and this proportion will increase with increasing price range and degree of thinning. Results from various compartments in 1954 show % of usable timber generally increasing with diameter. Volume % in the 0-4 m. portion, and to a lesser degree in the 4-8 and 8-12 m. portions, increases, but above 12 m. decreases, with decreasing diameter. Value % in the 0-4 m. portion increases, in the 4-8 m. portion is steady, and in the 8-12 m. portion decreases, with decreasing diameter. The results indicate that the maximum % of usable timber is obtained by heavy early thinning, followed by light thinning. Volume distribution is not affected by thinning grade but heavy thinning gives a high value in the lower part of the stem. With light thinning, net stumpage value increases slowly but reaches a higher final level than with heavy thinning, although the latter gives an early rapid increase.

4414. SPEIDEL, G. Die Wertklasse als Gütemassstab in der Forsteinrichtung. ['Value class' as a standard of quality in forest management.] *Forst-archiv* 26 (10), 1955 (217-24). 4 refs. [G.g.]

Urges the need for including appraisal of the timber quality of the growing stock in routine enumeration and stand-description work, suggesting that this should be based on estimates of the proportion by volume of the individual log-grades in the total tree or stand volume. To this end, formulae are deduced and applied to yield-table data to show that when the length of a butt log is a given proportion of tree height, its volume represents an almost constant proportion of tree volume, except in trees below middle age. The basic mathematical condition for this constancy appears to be nearly enough satisfied in the common German tree species from middle age on. Thus the lengths of bole having volumes of 25, 50 and 75% of tree volume correspond to 12.5, 30 and 51.5% of tree height, and a stick marked off at these fractions of its total length can be used for sighting these heights on the tree while appraising the quality of the respective stem portions. The topmost portion is neglected as being too difficult to grade and of little value. Each of the lower 3 portions is appraised according to the standard German grading rules (Homa), with very minor modifications, comprising 5 classes of wood quality. For estimates of stand quality, sampling procedures are suggested which are readily combined with ordinary routine enumeration work. The 5 'value classes' proposed range from (1) in which the three lower 'quarter-volumes' are 100% grade A, (5) ditto 100% firewood. A further class 0 is included for veneer logs if present. The mean value class of a stand is found by multiplying together the % by volume of each timber grade present and the 'value class' number appropriate to that grade, and taking the sum of the products. In statistics, the % of each grade should be stated, and a conventional form of notation is suggested for this purpose.

4415. HERRICK, D. E., and JACKSON, W. L. The butt log tells the story. *Sta. Note Cent. St. For. Exp. Sta.* No. 102, 1957. pp. 2. 2 refs.

Gives a table based on examination of logs from 203 trees of *Quercus velutina* [cf. F.A. 18 No. 1662], showing tree quality index by diameter, merchantable height and log grade. The index was used on 76 standing trees which were then felled and cross-cut. The difference between predicted and actual average quality index was < 4%. These values assume full recovery of high-quality timber.

526. Log Measurement. Scaling

See also No. 4739.

4416. BROWN, G. S. Log measurement in South East Asia and the Pacific. *Malay. Forester* 20 (2), 1957 (73-9).

Summarizes material collected on log-measurement systems used in different countries of the region, with particular reference to units employed, diameter measurement, length measurement, and volume estimation.

527. Solid Volume of Stacked Products (including Converting Factors)

4417. BICKFORD, C. A. Converting factors for stacked wood. *For. Res. Note Ntheast. For. Exp. Sta.* No. 69, 1957. pp. 3. 1 ref.

From observations in the Allegheny National Forest, a table of factors for converting stacked to solid wood, based on dot-grid counts on photographs, is given for round and split, barked and unbarked wood in cords 48, 50, 52 and 60 in. long.

4418. KLOWAK, B. G. Measurement of wood in block piles. *Pulp Paper Mag. Can.* 58 (3), 1957 (182-4, 227).

From aerial photographs the pile is stereoplotted with 5-ft. contours. To obtain the volume of the pile from the contoured map, the area of each contour is determined by planimeter, and the volume between the 1st and 2nd contours is determined by multiplying the mean area of these two contours by the contour interval (i.e. 5 ft.); the procedure is continued for successive contours until the volume of the whole pile is determined. Pile volumes have been checked for 2 years against factory production of chips and pulp, separately for softwoods and hardwoods. Pulp production from piles containing up to 8 months' supply can be predicted to ± 2 to 3 days' supply.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 3831, 4392.

4419. WIROATMODJO, R. S., and MOEKLAR EFFENDI, R. Hubungan antara kerapatan tadjuk dengan kerapatan bidang dasar pada hutan tanaman djati. [The correlation between density of the canopy and density according to basal area in Teak stands.] *Rimba Indonesia* 6 (1/2), 1957 (35-51). 6 refs. [Jav.e.e.]

If Teak plantations are tended as prescribed in instructions, the density of canopy (a) expresses density by number of trees (b) and will indicate basal-area density (c). In many stands that have been differently treated, (b) is less than it should be,

although (c) is perhaps similar to that of normal stands. To ascertain the relationship between (a) and (b) in such stands, measurements were made on sample plots in Teak plantations of different site quality and age. Results [shown in graphs and tables] indicate that in young and old stands where (a) is low, and in young stands where it is high, measurements of (a) can be used to estimate (c), but in old stands with high (a) there is no such correlation. For practical use in such stands both (a) and (c) must always be taken at an average of 0.9. (a) can be measured by Moeklar Effendi's formula [based on the breadth of each of 2 crowns and the distance between them]. *From authors' summary.*

54. Assessment of Site Quality

See also Nos. 3632, 3656, 4400-1, 4478-80.

4420. GEVORKIANTZ, S. R. *Site index curves for Red Pine in the Lake States.* *Tech. Note Lake St. For. Exp. Sta.* No. 484, 1957. pp. 2. 1 ref.

4421. GEVORKIANTZ, S. R. *Site index curves for White Pine in the Lake States.* *Tech. Note Lake St. For. Exp. Sta.* No. 483, 1957. pp. 2. 1 ref.

4422. GEVORKIANTZ, S. R. *Site index curves for Red Oak in the Lake States.* *Tech. Note Lake St. For. Exp. Sta.* No. 485, 1957. pp. 2. 1 ref.

4423. BEAUFIT, W. R. *Influence of soil and topography on Willow Oak sites.* *Occ. Pap. Sth. For. Exp. Sta.* No. 148, 1956. pp. 12. 2 refs.

From an analysis of 183 dominant or co-dominant sample trees on 83 plots in (1) the Mississippi Delta and (2) other Southern river bottomlands, regression equations were worked out for the effect of some factors on site index. The effect of the most easily ascertainable, viz. topography in relation to flood level and clay content for (1) or K content for (2), is shown in graphs and tables for stands with a b.a. of 110 sq. ft. of trees $\geq$ 6 in. d.b.h. High position above flood level and low clay or K contents are favourable.

4424. NELSON, T. C., and BEAUFIT, W. R. *Studies in site evaluation for Southern hardwoods.* *Proc. Soc. Amer. For.* 1956, 1957 (67-70). 6 refs.

Reviews current work on the subject and describes the difficulties involved (some 40 species, many young or degraded stands). Two methods of site evaluation are described in some detail; (1) the construction of regressions for height growth of separate species to be compared with that for *Pinus taeda*; (2) % of clay and of K in the top-soil.

4425. GÜNTHER, M. *Untersuchungen über das Ertragsvermögen der Hauptholzarten im Bereich verschiedener Standorteinheiten des württembergischen Neckarlandes.* [Yield studies on the main species on various site types of the Neckar region in Württemberg.] *Mitt. Ver. forstl. Standortskart.* No. 4, 1955 (5-31 + 1 sketchmap). 81 refs. [G.g.]

Compares (so far as the data permit) the growth and yield of Beech, Oak, Pine, Spruce and Larch on 7 site types distinguished chiefly by soil and ground vegetation (all in hardwood forest types), the yield of each site type under each species, and the yield of

similar site types in different climatic growth regions, on the basis of data from permanent and temporary sample plots and from working plans. Questions of method in the comparison of such heterogeneous material, and species comparability, weighting, variations, statistical error, etc. are discussed. With the help of index numbers based on relative performance of species on a site, yield potentials of site types are compared and a system of site quality classification independent of existing stocking is worked out.

4426. HASENMAIER, E. *Orientierende Untersuchungen über die Wuchsleistung von Fichtenbeständen im Bereich der wichtigsten Standorteinheiten des Wuchsbezirks 'Waldenburger Berge'.* [Preliminary studies on the yield of Spruce on the chief site types of the 'Waldenburger Berge' region [N. Württemberg].] *Mitt. Ver. forstl. Standortskart.* No. 4, 1955 (32-8). 5 refs. [G.g.]

Clear correlations were found between yield and the moisture content and pH of 4 site types on sandy soils, but no significant yield differences between different soils of similar pH. Growth differed considerably from that shown by the Württemberg yield tables.

4427. KOCH, J. *Untersuchungen über das Wachstum von Fichtenbeständen im Bereich verschiedener Standorteinheiten des nördlichen Oberschwabens.* [The growth of Spruce on sites of different categories in Northern Upper Swabia.] *Mitt. Ver. forstl. Standortskart.* No. 4, 1955 (39-51). 24 refs. [G.g.]

The site categories concerned, distinguished primarily by soil and plant-sociological criteria, showed clear differences in yield data, particularly when grouped into series according to the type and degree of degradation. Where this was far advanced, soil texture no longer made any difference.

4428. MOOSMAYER, H. U. *Die Wuchsleistungen der Fichte und Buche auf den wichtigsten Standorteinheiten im Forstamt Königsbrunn.* [Growth of Spruce and Beech on the main site types in Königsbrunn district [N. Württemberg].] *Mitt. Ver. forstl. Standortskart.* No. 4, 1955 (52-60). 12 refs. [G.g.]

With one exception, it was possible to arrive at statistically assured mean yield values for the site types distinguished (7 for Spruce, 3 for Beech). Spruce, all first-generation, yielded up to 3 times as much in volume as Beech on some sites.

4429. DAGNELIE, P. *Recherches sur la productivité des hêtraies d'Ardenne en relation avec les types phytosociologiques et les facteurs écologiques. Deuxième partie. Utilisation d'un critère de station dans les hêtraies d'Ardenne.* [The productive capacity of Beech forests in the Ardennes related to types of plant association and ecological factors. Part II. Use of a site-quality criterion in the Ardennes Beech forests.] *Bull. Inst. agron. Gembloux* 24 (4), 1956 (369-410 + 1 tbl.). 44 refs. [F.f.] E.M.B.

Data are presented from measurements of height and girth and estimations of age on 24 suitable sites. The procedure used (measurement of the 5 largest stems on an area of 6 ares) is expounded, along

with a method of adapting Wiedemann's yield tables for heavily thinned stands to the purpose of this study. [Cf. *F.A.* 18 No. 1975.]

4430. VLASZATY, Ö. Az erdei- és feketefenyő termőhelyigénye a nyírségi és a Duna-Tisza közti homokon. [Soil requirements of Scots and Austrian Pine on the sand soils of the 'Nyírség' region and between the Danube and the Tisza.] *Erdész. Kutatás.*, Budapest 1955 (3), (85–108 + smries in suppl.). [Hu.hu.russ.e.g.]

Correlates quality class with soil moisture, here considered critical for success, as expressed in 'total hygroscopicity' (hy.) values [see *F.A.* 16 No. 2741]. A poor uneconomic growth of both Pines will exist with a hy. value of 30 if there is no pan down to 100 cm. With hy. = 30–40, quality class is IV–VI, if CaCO_3 (totalled for the horizons in the same way) does not exceed 2500. With hy. > 40, quality class IV and better may be expected. Trees ultimately die if the soda [Na_2CO_3] content is > 0.06–0.08%. Seed provenance and broadleaved mixtures are important. Birch and White Poplar are recommended on the driest soil, and Robinia, *Tilia tomentosa* and Oaks at hy. values of 50–60. On fresh soils Black Poplar, Norway Maple and Pedunculate Oak are useful when establishing Pines.

4431. BOTVAY, K. Adatok a kapilláris vízemelőképeség indikációjának felhasználására az alföldi homokok akáctermőképességének becslésében. [On the use of the capacity for capillary rise as a test of the suitability of sandy soils for Robinia plantations on the Great Hungarian Plain.] *Erdőmérnöki Főiskola Közleményei, Sopron* 1956 (1), (23–45). 20 refs. [Hu.hu.russ.g.]

Twenty-eight stands in 5 sandy regions were arranged by growth in site classes, accurately to tenths of a class. The soil in each stand was sampled to the water-table and mean samples were prepared by bulking samples from the various horizons. The capillary rise of water in each of the soils was measured after $\frac{1}{2}$, 1, 2, 3, 5, and 25 hours and at the limit of rise. The highest correlation with site class (coefficient 0.60) was given by the values at 2 hours. Exclusive reliance on this one simple test is deprecated.

4432. OVINGTON, J. D. The form, weights and productivity of tree species grown in close stands. *New Phytol.* 55 (3), 1956 (289–304). 24 refs. O.R.S.

Measurements were made in stands in the Forest of Dean, at Bedgebury, Kent, and in Thetford Chase. Some 12 species of conifers and 8 of deciduous trees were represented. Data obtained on tree form, fresh and dry weight per tree and per ha., and water content are given in tables and graphs. A rough assessment suggests that the annual production of dry matter is significantly greater for 19 of the 28 plots under forest, than it would be under agricultural crops. The weight of organic matter contained in the trees, the ground flora and the litter, and the efficiency of trees in using sites are discussed.

55. Age Determination

See Nos. 4400–1.

56. Increment. Development and Structure of Stands

See also Nos. 3759, 3762–3, 3882, 3908, *et seq.*, 4016–7, 4039 *et seq.*, 4057 *et seq.*, 4106, 4392, 4509.

4433. WEIHE, J. Das Wachstum der Fichte nach den badischen Versuchsflächen. [The growth of Spruce on trial plots in Baden.] *SchrReihe bad. forstl. VersAnst.* No. 11, 1955. pp. 85. 52 refs. [G.g.]

The investigation is based on 36 trial plots (53 treatments) situated mainly in the Schwarzwald and its foothills at altitudes of 200–1200 m. in a suitable climate and generally good soils. The influence of site factors and treatment on height, b.a. increment, and yield is analysed and comparisons are made with two local yield tables. Height growth on sites tending to dryness in late summer was probably stimulated by wide spacing or heavy thinning. B.a. increment appeared to be more dependent on rainfall than on thinning, the latter causing no stimulation on good sites. The general pattern of growth appeared to be most closely related to soil factors. No clear conclusions on the effect of thinning on total yield could be drawn, but a tendency towards falling yield with heavy thinnings was observed.

4434. PRODAN, M. Durchmesser- und Massenzuwachs in Eichenbeständen. [Diameter and volume increment in Oak stands.] *SchrReihe bad. forstl. VersAnst.* No. 9, 1953 (37–48). 16 refs. [G.g.]

Supplements Mitscherlich's general yield tables by tables relating: (1) b.a. increment to mean diameter and b.a.; (2) c.a.i. to (a) mean diameter and mean diameter increment, (b) mean diameter and mean height, and (c) b.a. increment; and (3) total % value increment to % volume increment and % value increment per cu. cm. on reaching higher diameter classes, all based on figures at the beginning of the period. The development of diameter increment by diameter classes is analysed for various stands and treatments.

4435. ARMĂȘESCU, S., and DIȘESCU, R. Corelația între diametru, înălțime și vîrstă la arboretele de fag din R.P.R. [Correlation between diameter, height and age of Beech in Rumania.] *Rev. Pădurilor* 71 (7), 1956 (429–32). 9 refs. [Rum.russ.g.]

Represents graphically, and discusses, data derived from the measurement of 402 trees on the relation of these 3 variables as a basis for constructing yield tables.

4436. PEREZ FIGUEROA, C. A. Estudio forestal del laurel, *Cordia alliodora* (R. & P.) Cham., en Costa Rica. [A forestry study of *C. alliodora* in Costa Rica.] *Abstr. of thesis*, in *Suplemento Bibliográfico de Turrialba*, Turrialba 6 (1/2), 1956 (71). [Span.] O.R.E.

This species is considered important for the low humid regions of Costa Rica because of its excellent timber, rapid growth, and good regeneration capacity. Height growth and diameter increment (calculated from growth rings assumed to be annual), size of merchantable logs, form class etc. were studied. The economic felling age was found to be 25 years.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 3813-4, 4172.

4437. DUFFIELD, J. W. A ratchet wrench for oversize increment borers. *For. Sci.* 3 (1), 1957 (21). 1 ref.

By the provision of a double handle to a mechanic's wrench, and a retaining lock to facilitate retraction, cores 8-11 mm. in diam. (instead of the usual 4-5) can be more easily taken from even the harder woods

4438. SPURR, S. H. Recording micrometer. *For. Sci.* 3 (1), 1957 (66). 1 ref.

Includes measurement of crown diameters on aerial photos and vessel widths as additional applications for the instrument [see *F.A.* 12 No. 3501] used in Sweden for measuring increment cores.

4439. PLAVŠIĆ, M. Debljinski rast i prirast poljskog jasena (*Fraxinus angustifolia* Vahl). [The diameter increment of *F. angustifolia*.] *Šum. List* 80 (9/10), 1956 (273-82). 12 refs. [Croat.croat.g.g.]

The investigations were made in the forest described in a previous paper [see *F.A.* 17 No. 3103]. The 10-m.-wide survey strips were first delineated on the map, to ensure greater objectivity, and all trees of > 10 cm. d.b.h. were calipered in 2-cm. diam. classes, the upper-storey (main stand) trees being treated separately from the lower-storey trees. Heights were also measured, and a height curve drawn for each stand. Stand age (40-100 years) was determined by counts on at least 10 stumps per stand. In all, measurements were made in 45 stands on 1st-quality sites (total area of strips 65.8 ha.), and in 24 stands (strip area 18.6 ha.) on 2nd-quality sites. A total of 29,562 stems was measured (19,180 on site class 1). Diameter growth curves were drawn from the calculated d.b.h. values of the trees of mean b.a. for both the upper and lower storey; the d.b.h. increment and bark thickness being determined only for the upper storey. Results show diameter growth (d.b.h. ca. 40 cm. at 100 years, m.a.i. ca. 4 mm. for site quality 1) to be very low; and since Ash wood is considered to be of good quality only when m.a.i. exceeds 6 mm., its quality here is also poor. The low increment is explained by insufficient thinning from above.

4440. Seasonal stem growth at McCleary forest [Washington]. *Rep. Pacif. Nthwest. For. Range Exp. Sta.* 1956, 1957 (32-3).

Three years' records of radial increment indicated that stem growth of Red Alder, Western Red Cedar and Douglas Fir begins in the first week of May and ends in late September or early October, later for Douglas Fir than for the other two species. Increment was appreciably less in 1956 than in 1954-55, presumably because of the cold weather in Nov. 1955.

4441. BOGGESE, W. R. Weekly diameter growth of Shortleaf Pine and White Oak as related to soil moisture. *Proc. Soc. Amer. For.* 1956, 1957 (83-9). 28 refs.

Further data from this experiment confirm the

conclusions drawn in an interim report [cf. *F.A.* 15 No. 562]. Soil moisture probably becomes a limiting factor in the diameter growth of upland forest trees in Illinois at some time during most growing seasons. It is suggested, however, that the factor or factors that influence the final cessation of diameter growth in the autumn may depend on the environmental conditions that prevail in a given year.

4442. BELL, D. B. The relationship between height growth in conifers and the weather. *Abstr. of thesis, in J. Oxf. Univ. For. Soc. (Ser. 4)* No. 5, 1957 (11-4). 6 refs.

Investigations were made on 16 trees each of Sitka Spruce and Douglas Fir, both about 25 years old, growing in pure stands on plateau gravel in Bagley Wood, near Oxford. Good agreement was found between the annual fluctuations in mean height increment of Douglas Fir and that in (a) the mean daily temperature over July and August of the previous year, and (b) the total rainfall during April, May and June of the current year. Similar fluctuations were found in Sitka, but with a marked lag of one year, the agreement being with (a) of two years previously and (b) of the previous year. Needle production was investigated on 5 trees of each species and it was found that the variation in the number of needles on successive annual shoots of Sitka Spruce is very much greater than that in Douglas Fir, and bears a distinct correspondence to fluctuations in height increment, and therefore with the climatic factors, rainfall and temperature, related to this. In Douglas Fir there is some suggestion of a lag of one year between needle production and height increment, and of a certain degree of correspondence between needle production and mean minimum temperature during the previous year.

4443. BAMPING, J. H., and HERRICK, A. M. Contribution of quality to value increment in hardwood sawtimber. *J. For.* 55 (4), 1957 (259-65). 5 refs.

Studies were made at North Lake, Wisconsin, in a mixed stand of *Quercus rubra*, *Q. alba* and *Acer rubrum* to determine the ratio of quality appreciation (increment) to the total value increment. Height and d.b.h. were measured and log gradings made on 672 trees in 1945 and again in 1955, when each tree was also given a quality grading according to the Purdue log-grading rules [cf. *F.A.* 18 No. 813], and from an equation expressing the tree quality index (QI) for each butt-log grade, the QI of each tree in 1945 was estimated. The total increase in value was then got from the difference between volume and QI in 1945 and in 1955, and the quality increment by subtracting from this total increase the value of the volume increment. The formulae for finding the ratio of quality increment to total value increment for the 3 butt-log grades are:—Grade 1 = $0.343 - 0.005(\text{d.b.h.})$; Grade 2 = $0.306 - 0.004(\text{d.b.h.})$; Grade 3 = $\frac{-4.26 + 6.46(\log. \text{ of d.b.h.})}{\text{d.b.h.}}$

Ratios of quality increment to total value increment ranged from 5.6% to 46.3% with a mean of 23.4%, and S.D. 6.3%. The ratios are apparently

not influenced by species; they are greatest for high-grade trees of any given d.b.h. The greatest variability is among Grade-3 trees. A table shows the ratio by d.b.h. for the 3 grades.

4444. STOFFELS, A. Snelle bepaling van het aanwasprocent van grovedennenopstanden. [**Rapid determination of the increment per cent of Scots Pine stands.**] *Ned. Boschb.-Tijdschr.* 29 (5), 1957 (130-5). 13 refs. [Du.f.]

Presents a table of values for the constant k in Schneider's formula, for trees of mean diameters 10-30 cm. and mean heights 8-23 m.

562. Volume Increment

4445. KLEPAC, D. Funkcionalni odnos između godišnjeg volumnog prirasta i prsnog promjera za jelu u prebornoj šumi. [**Functional relationship between the annual volume increment and d.b.h. for Silver Fir in selection forests.**] *Šum. List* 80 (1/2), 1956 (1-16). 4 refs. [Croat.croat.f.]

Presents, in the form of tables and graphs, the results of investigations carried out in order to confirm or disprove the apparent finding that Silver Fir in the selection forests of the Gorski Kotar (N.W. Croatia) shows a greater volume increment for a greater mean d.b.h. Stands belonging to three communities (*Fagetum abietetosum*, *Calamagrosteto-Abietum* and *Abieto-blechnetum*), on two different soil types (limestone and silicate), and of different b.a. (between 23.8 and 45.0 sq. m./ha.) and different site classes (from the 10th to the 17th by the Algan or Schaeffer classifications) were investigated, making in all 8 trial plots totalling some 260 ha. The following measurements were taken: 1848 heights by Blume-Leiss hypsometer, and 4533 increment cores from 3528 stems. In 7 trial plots it was found that the relationship between the volume m.a.i. (y) and the d.b.h. (x) may be expressed by a linear equation with a positive gradient; only in one plot was the relationship parabolic, the curvature appearing only in the region of high values of x . The gradients of the linear equations are significant, since their values exceed the S.D. many times. This means that, in selection stands, the variation of the m.a.i. with d.b.h. is linear up to a certain d.b.h. value, a value that is higher for the limestone soil and lower for the silicate soil, and is never < 75 cm.

4446. NISHIZAWA, M., MANABE, A., and MINAI, J. [Direct estimation of stand increments. II. Individual tree sampling.] *J. Jap. For. Soc.* 38 (8), 1956 (291-6). 4 refs. [Jap.jap.e.]

Gives the results of various methods combining three empirical volume formulae, increment-core data and various formulae for increment prediction, tested on two plots of Japanese Larch aged 26 and 31 years, and compared with yield-table data.

4447. STRAND, L. Kubikk- og tilvekstmasser i forskjellige alders- og tetthetsklasser. [**Volume and increment in different age and density classes.**] *Tidsskr. Skogbr.* 65 (2), 1957 (137-45). 4 refs. [Nor.]

Figures from actual measurements made during the forest survey of Elverum and Våler, 1953, were compared with those from yield tables and both are

shown in graphs. Mean height showed little variation with density class, but when figures for mean ht. by age classes were compared with yield tables there were systematic errors; e.g. for Spruce, site class 3, the measured values were above yield table values up to 80 years, and then below. The range of diameter classes was wider in the observed than in the yield-table material, and b.a. and volume values also differed. Observed increment, unlike the yield-table values, showed comparatively little variation with age. It is concluded that caution is needed in calculating volume and increment from a yield table when the treatment of the stand differs from that pre-supposed in the table.

564. Forecasting Increment

4448. FERREE, M. J., and HAGAR, R. K. **Timber growth rates for natural forest stands in New York State.** *Tech. Publ. N.Y. St. Coll. For.* No. 78, [1956]. pp. 56.

The information presented in this report is for estimating growth of natural timber stands in N.Y. State; the data and methods of application are for use in predicting average annual growth over a 10-year period. The procedure consists basically in relating growth to quantity of growing stock/acre, but the influence of 4 other important growth determinants (region of the state, forest type, forest site quality, and tree-diameter distribution) are considered in establishing this basic relationship. The report is divided into 4 sections: (1) explains the growth determinants, (2) contains the tables of data for estimating growth on the basis of these determinants, (3) illustrates the application of the growth tables, and (4) presents the methods that were employed in developing the growth guides.

565. Sample-Plot Technique

See Nos. 3790, 4057.

566. Yield Tables and Their Construction

See also Nos. 4396, 4453.

4449. BARNES, G. H. **Yield tables for Douglas Fir under intensive thinning regimes.** *Res. Note Ore. For. Exp. Sta.* No. 1, 1955. pp. 4. 3 refs.

A conversion to American units of the British Forestry Commission tables [see *F.A.* 15 No. 2758].

4450. **Normal yield tables for Black Spruce, Jack Pine, Aspen and White Birch in Northern Ontario.** *Report, Division of Forest Management Ontario Department of Lands and Forests* No. 24, 1956. pp. 40.

4451. CROCOLL, A. Der Massenertrag von Pappelbeständen in der nordbadischen Rheinebene. [**The yield of Poplar stands in the Rhine plain in N. Baden.**] *Forstwiss. Forsch.* No. 8, 1957. pp. 36. 2 refs. [G.]

Presents data—not considered as final—based on 24 trial plots on good sites and on the enumeration of Poplar stands of > 0.1 ha., totalling nearly 1000 ha., of which ca. 85 ha. are > 50 years old. $\times$ *Populus marilandica* preponderated in the over-40 age-group, $\times$ *P. robusta* in the under-30. Form factors, form

heights, % branches, stems/ha., b.a./ha., height and diameter growth, m.a.i., c.a.i., and growing stock, and their interrelationships are discussed and tabulated, and a tentative yield table for $\times P. marilandica$, site class II, spaced 5×5 m., is presented. Above 50 years, m.a.i. nowhere exceeded 15.1 cu.m., and this disparity with Schmitz-Lenders' yield tables [cf. *F.A.* 10, No. 2337] is analysed. While there is a good correspondence for height and form development, the author's figures for b.a./ha. were only about $\frac{1}{3}$ of those assumed in Schmitz-Lenders' tables, and it is suggested that the latter's method of computing values for total stands from measurements of single trees or groups was fallacious.

567. Stand Tables

4452. KLEPAC, D. Upotreba frekvencijskih krivulja broja stabala pri 'opisu sastojina'. [Stem-number frequency curves and their application in the description of stands.] *Šum. List* 80 (11/12), 1956 (357-69). 12 refs. [Croat.f.]

After an introduction in which the Gauss and Liocourt curves are described and the cumulated frequency, dissymmetry, anamorphosis etc. are explained, the author follows French investigators (not cited) in the interpretation of frequency curves, and, finally, explains the graphical signs used by Silvy-Leligois [see *F.A.* 17 No. 4343] for the description of stands.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

4453. MITSCHERLICH, G. Der Eichenbestand mit Buchen- und Tannenunterstand. Ertragskundliche Untersuchung der Eichenversuchsflächen in der badischen Vorbergzone. [Oak stands with Beech or Silver Fir understoreys. A yield study in the Oak trial plots in the Baden foothills.] *Schr.Reihe bad. forstl. VersAnst.* No. 9, 1953 (3-35 + 58 tbls. in annexe). 43 refs. [G.g.]

The study is based on 58 trial plots on good sites established 20 years ago in the Schwarzwald foothills, mostly in stands aged 50-60 years. Enumeration data are given in an appendix. The development of upper and lower storey under various treatments is traced with regard to both volume and value, distinguishing in the latter case between veneer-Oak and other sites. Tentative '3-dimensional' yield tables relate b.a. of Oak and of the total stand and volume increments to site class, age and density at any given age of the Oak. On these very good sites, the b.a. and volume increment of Oak were greatest at the greatest density represented. For value, the optimum varied with age and type of stand, but generally lay in moderately dense stands allowing the development of large Oak stems with the minimum of understorey required for clear boles.

4454. TIKKA, P. S. Haapametsiköiden raken-teesta ja laadusta. II. Laatu. [Structure and quality of Aspen stands. II. Quality.] *Commun. Inst. for. Fenn.* 45 (3), 1956. pp. 54. 26 refs. [F.i.e.]

Presents tables relating branchiness, stem form, stem rot, and other defects to age of stands and/or diameter and/or height of trees, also bark characters and the interrelation of defects. Length of clear stem, length of live crown and the % of decayed stem all increase with age and size, and also the proportion of sound length. Other tables show proportions of total wood usable as match-wood and the various types of waste which, including waste in manufacture, make up nearly 66% of total timber volume. Practical recommendations on silviculture, transport, etc. are given. [Cf. *F.A.* 17 No. 3135.] *From author's summary.*

58. Surveying and Mapping. Aerial Surveys

See also Nos. 3833-6, 4400-1, 4404, 4438.

4455. TROEDSSON, T. Den västtyska standorts-karteringen och dess användbarhet under svenska förhållanden. [West German site mapping and its applicability to Swedish conditions.] *Svenska Skogsv-Fören. Tidskr.* 54 (1), 1956 (11-21). 16 refs. [Sw.]

Discusses organization and methods, physical and chemical soil analyses, and uses in Germany, and compares German and Swedish conditions.

4456. HAARDT, M., and BUCH, M. W. VON. Die Standortskartierung im forstlichen Betrieb (Bedeutung und Zweck sowie Durchführung einer Standortskartierung). [Site mapping in forest management (its importance, purpose and execution).] *Svenska Skogsv-Fören. Tidskr.* 54 (1), 1956 (23-34). 11 refs. [G.g.e.sw.]

Includes the description of an example from a private forest in Schleswig-Holstein.

4457. Standortskartierung in Nordrhein-Westfalen. [Site mapping in Nordrhein-Westfalen.] *Allg. Forst- u. Jagdztg.* 128 (4), 1957 (65-92 + 4 maps). 39 refs. [G.g.e.]

A special number including articles on: principles and organization of site mapping in the State forests (*F. E. Eidmann*) [discussing the compilation of site maps by foresters, from soil and vegetation maps prepared by specialist institutes]; principles of soil mapping, particularly for forest site surveys (*E. Mückenhausen*) and, supported by maps for part of the district, an analysis of the soils (*E. H. Müller*), forest plant communities (*W. Trautmann*) and forest site types (*F. Klösel*) of the forest district Neuenheerse between the rivers Egge and Weser. Fifteen types are distinguished, soil maps being chiefly used on poor soils and vegetation maps where water relations are decisive. Recommendations for suitable species and treatments are given.

4458. [Soil-vegetation surveys.] *Proc. Soil Sci. Soc. Amer.* 21 (1), 1957 (103-17). 9 refs. O.R.E.

Includes the following papers contributed by the California Forest and Range Experiment Station in cooperation with the University of California: The soil-vegetation survey in California (*R. A. Gardner* and *A. E. Wieslander*) [principles and techniques of classification and mapping of both vegetation and soils]; Photo-interpretation of vegetation and soils in wild land areas of California (*R. E. Nelson*, *K. E. Bradshaw*, *A. E. Wieslander*); Soil-vegetation

information in range management planning and administration (L. T. Burcham and R. E. Storie); Uses of soil-vegetation survey information in watershed management (P. B. Rowe and E. A. Colman); and Uses of soil-vegetation survey information in road construction (J. R. Fisher and K. E. Bradshaw).

4459. NAYLOR, R. The determination of area by weight: forest survey experience. *N.Z. J. For.* 7 (3), 1956 (109-111).

Discusses the experience of the New Zealand National Forest Survey in determination of areas on maps. The methods described are planimetry, dot grid, intercepts, and weight. The last of these was by far the most satisfactory for determining large numbers of areas of irregular shape. Contact prints from the original map are used, and an electric vibrating tool cuts out the forest areas; weighing is done by separate pieces on a semi-automatic balance, and conversion from weight to area done on a computing machine.

4460. MERIN, J. R. Aerial photography for Philippine forest inventory. *Philipp. J. For.* 10 (1/4), 1954 (1955), (81-111). 47 refs.

A general account of the development of aerial surveys for forestry purposes, and detailed suggestions for such a survey in the Philippines.

4461. HAGBERG, N. Storskogbrukets karteringsmetoder med begagnande av flygbilder. [Mapping methods, using aerial photographs, of large forestry concerns.] *Svenska Skogsvärdens Tidskr.* 54 (3), 1956 (223-64). 10 refs. [Sw.sw.]

Discusses the requirements, methods and materials, costs and expenditure of time, and results, of the Forest Service (N. and S. Sweden), and the following large forest-owning companies, Svenska Cellulosa AB, Mo och Domsjö AB, Kopparfors AB and Korsnäs AB.

4462. LOWRY, W. V. Another idea on forest inventory mapping. *For. Chron.* 33 (1), 1957 (61-2).

A short account of a method successfully employed by a large lumber company for transferring forest-type data from aerial photographs to existing topographic maps. The latter are photographically enlarged to the scale of the aerial photos and printed on a transparent base. A slotted template laydown of the existing aerial photos is used to fix on the base map the positions of principal points and wing points, and the forest-type data are then transferred to the map by a Kail Radial Plotter. The method has been used to map several hundred thousand acres quickly and inexpensively.

4463. MEYER, M. P. Some observed effects of variations in photographic papers upon image perception in stereo vertical aerial photographs. *Abstr. of thesis*, in *Dissert. Abstr.* 16 (10), 1956 (1759-60). O.R.S.

Five trained interpreters tested 6 types of paper, using parallax difference measurements on 24 trees, counts of visible tree crowns, and relative eye fatigue etc. as criteria. A glossy, warm (brown) paper was rated first and a semi-matte cold (blue-black) paper last by all interpreters.

4464. MOESSNER, K. E. Aerial photo scale-protractors for mountainous areas. *Res. Note Intermt. For. Range Exp. Sta.* No. 40, 1956. pp. 7. 2 refs.

Describes and illustrates a revised design of the scale-protractor noticed in *F.A.* 14 No. 3636, intended for use in mountainous areas. There are 3 basic scales (1 : 10,000, 1 : 15,000 and 1 : 20,000).

4465. The avoidance of 'shadow point' on aerial photographs (including tables of flying times for various latitudes, focal lengths and negative sizes). *Leaflet. For. Timb. Bur. Aust.* No. 74, 1955. pp. 47. 6 refs.

[Cf. *F.A.* 17 No. 4337.] The nature of shadow point, its effect on interpreting forest cover, and factors influencing its position are discussed. Tables have been prepared showing the season of the year and the hours of the day during which the theoretical centre of shadow point will appear on aerial photographs in the southern hemisphere; they can also be used, by consulting the appropriate months of the season (e.g. July for January), in the northern hemisphere.

4466. BURGER, D. Identification of forest soils on aerial photographs. *For. Chron.* 33 (1), 1957 (54-60). 3 refs.

Three major components of the stereoscopic image of paired aerial photographs, namely relief, vegetation, and land use, are used to identify forest soils in terms of parent materials (texture and mineralogical composition), moisture regime, and depth to bedrock. Field knowledge of the forest ecology and of the geology of the area under consideration are basic requirements. *From author's summary.*

4467. WILLINGHAM, J. W. The estimation of forest management data from aerial photographic measurements. *Abstr. of thesis*, in *Dissert. Abstr.* 17 (3), 1957 (466). O.R.S.

Sixty-five $\frac{1}{10}$ -acre sample plots were established in *Pinus palustris* stands in an attempt to determine the relationship between two categories of variables: independent variables, measurable directly on photographs (e.g. tree height, crown density); and dependent variables, not so measurable (e.g. radial growth, age). Relationships between 4 variables of each type were studied and formulae were derived as follows: (1) radial growth = $+1.07-0.0111$ (tree height) - 0.00381 (crown density); (2) age = $-15.0 + 0.78$ (tree height) + 0.11 (crown density); (3) d.b.h. = $+0.6 + 0.2981$ (crown diameter) + 0.0843 (tree height) - 0.0331 (number of trees); (4) volume = $-114.0 + 1.111$ (crown density) + 3.030 (tree height) + 2.375 (number of trees). The number of $\frac{1}{10}$ -acre plots required to make estimates of the dependent variables within $\pm 10\%$ of the actual value was 44 for radial growth, 12 for age, 2 for d.b.h., and 29 for volume.

4468. MAYER, H. A., and WORLEY, D. P. Volume determinations from aerial stand volume tables and their accuracy. *J. For.* 55 (5), 1957 (368-72). 3 refs.

In studies on the determination of stand volume from aerial photo measurements made on 24 one-fifth-acre plots in upland Oak, it was found that the standard deviation due to systematic errors was 4 times that due to accidental errors. Ground control by measuring plots selected at random is necessary to determine a correction factor (f) for the systematic errors. The theoretical basis for computing the number of control plots necessary to obtain f with a standard error of $\pm 5\%$ is given; findings are tabulated for different photo volumes per plot, and different values of f . Since, in an aerial survey, the coefficient of variation must include the sampling errors as well as the systematic errors, it will be nearly twice that of a ground cruise; and to obtain comparable accuracy the measured plots must be 3-4 times as many as for a ground cruise. Determining volume by aerial survey is therefore only practical for large areas. Results from a cruise of 388.6 acres of the University Park, Pennsylvania are shown.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See also Nos. 3873-4, 4436.

4470. ZIEGER, E. Zur Abstimmung biologischer, technischer und wirtschaftlicher Erfordernisse in der Forstwirtschaft. Nutzungstechnische Erfordernisse. [The reconciliation of biological, technical, and economic requirements in forestry: Utilization.] Repr. from *Sitzungsberichte, Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin* 4 (13), 1955 (37-42). [G.]

The author gives a warning against the ill effects of fixing assortment targets for forest districts without regard to local conditions. This frequently leads to wasteful sorting, over-cutting, disguised clear fellings, over-thinning and other practices endangering the residual stands and future yields. He also stresses the dangers and drawbacks of the official policy of single-tree forestry from the point of view of silviculture, economics and the worker, and advocates the introduction of barking machines and other equipment from abroad.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 4401, 4452.

4471. BRUNS, P. E. The philosophy and techniques of sustained yield planning in forestry. *Abstr. of thesis, in Dissert. Abstr.* 16 (11), 1956 (1983). O.R.S.

Existing methods of forest regulation are evaluated and the philosophical and historical development of regulation of felling is presented with emphasis on the work of 19th-century European foresters. A method of area regulation of uneven-aged forests developed by the writer is described. Two examples of recent American experience in regulation, typical cases as encountered in even- and uneven-aged forests, are described.

4469. MORRIS, A. W. Aerial volume table for Black Spruce type for the northeastern coniferous zone. *Pulp Paper Mag. Can.* 58 (3), 1957 (324...352). 6 refs.

From statistically adequate ground sampling of even-aged, largely pure, defect-free *Picea mariana*, typical of a 1000-sq.-mile area along the N. side of the St. Lawrence estuary, a volume table in cunits/acre was prepared for 5 age classes (30, 50, 70, 90, 120) and 4 densities (100-10%). A linear correlation between stand density and volume within an age class is demonstrated. Twenty aerial photos (stereo pairs) are marked to show each of these densities in each age class, with notes on the interpretation of age (from tone, texture, crown shadow). The photographs of 9 contract areas are then stockmapped from such interpretation in cunits/acre and the totals of each contract compared with actual cuts. The over-all S.E. for volume was 7.7% in 5740 cunits. The statistical working is given in detail.

4472. OSMASTON, F. C. Yield regulation. *Quart. J. For.* 51 (2), 1957 (139-47).

After indicating the need for controlling all fellings to ensure the health, structure and sustained yield of a forest, the author notes the difficulty of organization in a forest unit composed of even-aged stands of several species with various rates of growth on a variety of sites. To integrate these heterogeneous stands in one management unit he suggests a classification of stands by percentage of maturity, with a calculation of an average rotation. An area yield can then be calculated. *Author's summary.*

4473. BELL, J. F., and HELLAND, M. L. Combining two species with different rotational ages in determining the allowable annual cut. *J. For.* 55 (5), 1957 (351-3). 5 refs.

Describes a method of calculating the allowable annual cut on 128,077 acres of forest land in Oregon, with Douglas Fir on a 100-year rotation and Hemlock on a 70-year rotation, as the main forest types. The yield is calculated by an area method, allowing a 90-year period of adjustment to obtain a normal age-class distribution, as there is at present a preponderance of trees in the 10- to 20-year age-class.

4474. LACHAUSSÉE, E. Cinquante années d'application de la méthode de contrôle. [Fifty years of application of the *méthode de contrôle*.] *Bull. Soc. for. Franche-Comté* 28 (5), 1957 (241-54). 7 refs. [F.]

Describes the management and development of 54 ha. of Silver Fir and 9 ha. of coppice in process of conversion to conifers, acquired 25 years ago and managed by the strict *méthode de contrôle*. In general the evolution has been in the direction of regular stands, covering whole compartments or parts of compartments, and it is concluded that the *méthode de contrôle* could be applied as well to regular plantations as to natural forest.

64. Forestry as a Business: General

See also No. 4828.

4475. MACGREGOR, J. J., and IRVINE, T. W.; BALMAN, F. E. *Survey of private forestry prices, England and Wales. Third report 1956. Part 1. Round timber prices. Part II. Minor forest produce prices.* Imperial Forestry Institute, Oxford. 1957. pp. 58. Price 5s. [Cf. *F.A.* 18 No. 803.]

4476. MACGREGOR, J. J., IRVINE, T. W., and BALMAN, F. E. *Survey of private forestry costs, England and Wales: piecework rates 1956.* Imperial Forestry Institute, Oxford. 1957. pp. 19. Price 2s. 6d.

4477. DICKSON, H. Synpunkter på valet av kalkylräntefot vid skogsvårdslagens tillämpning. [Aspects of the choice of rate of interest in calculations relating to the application of the forest law.] *Svenska SkogsvFören. Tidskr.* 54 (1), 1956 (35-46). 8 refs. [Sw.]

Discusses the selection of a suitable rate for different terms in the forest law, e.g. determining the limit between productive and non-productive forest.

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 4062-3, 4161, 4400, 4413-5, 4443, 4453.

4478. JOHNSON, R. S. *The forest tax situation in Nova Scotia and a proposed remedy.* *Rep. atlant. Sect. Canad. Inst. For.* 1956, 1956 (11-36). 32 refs.

Discusses anomalies in assessment, with full examples, and proposes improvements in the system of assessment.

4479. HAWBOLDT, L. S. *Productive capacity classifications for forest land assessment.* *Rep. atlant. Sect. Canad. Inst. For.* 1956, 1956 (37-51).

Discusses in detail methods of classifying forest land by site quality, for purposes of tax assessment, making use of the data available in Provincial forest inventories (volume/age, height/age, and height-density/volume curves).

4480. ALEXANDER, B. R. *Suggested methods of application of productive capacity classifications for forest assessment.* *Rep. atlant. Sect. Canad. Inst. For.* 1956, 1956 (52-60).

Makes proposals for the practical application of methods discussed in previous papers at the same meeting [see preceding abstracts].

66. Costing of Logging Operations

See also Nos. 4113, 4125-7, 4129, 4133, 4135, 4485-6, 4490-2.

4481. CAROW, J., and SILEN, R. R. *Using the staggered system: what are logging costs?* *Timberman* 58 (4), 1957 (48-53). 3 refs.

Analyses 5 years' records from 34 felling areas (mean 27 acres) under the staggered setting system [see *F.A.* 11 No. 215] in the Willamette National Forest, in stands predominantly of 400-year Douglas

Fir. Costs of logging by (1) tractors, (2) high lead, (3) a combination of (1) and (2), and (4) various combinations of tractor, high lead and skyline methods, are compared with regional averages. Man-hour/bd. ft. data are included.

67. Assessment of Financial Results; Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

4482. OETTING, F. *Büromaschinen.* [Office machines.] *Forstarchiv* 28 (3), 1957 (71-2). [G.]

Describes the working of the combined typewriter/calculating machines, Siemens Multiquick and Saldo-quick-Kombination, and how they can be used in forestry.

68. Administration and Organization of Forest Enterprises**681. National (Federal, State) Forest Services and Administration**

4483. HUGHES, J. F. *The utilisation division of the forest department, Tanganyika Territory. II.* *Emp. For. Rev.* 36 (2), 1957 (186-99).

A list is given of the staff, buildings and equipment. Approximate capital and running costs are shown and the research programme is outlined. [Cf. *F.A.* 18 No. 3242.]

683. Office Organization

See Nos. 4402, 4482.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

See also section 383 and Nos. 4125-6, 4142.

4484. WESTLING, A. *Skogsbruket och vägarna.* [Forestry and roads.] *Svenska SkogsvFören. Tidskr.* 54 (2), 1956 (107-22). [Sw.]

Discusses the location of forests and industries in Värmland, supplies of timber, forest and public roads and bridges, regulations on vehicles and loads, and improvements needed in the road system.

4485. VADNAL, A. *Optimalno število in lokacija vzporednih produktivnih gozdnih transportnih žil na položenem pobočju in pri konstantni gostoti transportirane lesne mase.* [The optimum number and distribution of economic parallel forest roads assuming a gentle slope and a constant volume of timber to be transported from the unit area.] *Gozd. Vestn.* 14 (5), 1956 (129-35). 1 ref. [Sloven.f.]

A solution is obtained for a problem similar to that treated in a previous article [see *F.A.* 17 No. 1889], the only difference being that the slope is gentle enough to enable the timber to be transported both upwards and downwards to the nearest road.

4486. WALLACE, O. P. *Ratios for determining the economic road and landing or skidway spacing.* *J. For.* 55 (5), 1957 (378-9). 3 refs.

A table is given showing the relative costs of skidding roads and landings, based on the ratio of landing spacing to road spacing, for both level and sloping ground.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

71. Marketing of Forest Products: General

4487. **Marketing forest products from small woodland areas in the Northeast. 1. Selling practices of woodland owners and extent of home use of timber products.** *Bull. Vt. agric. Exp. Sta.* No. 595, 1956. pp. 83. 24 refs.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also Nos. 4624, 4822-3.

4488. **Elemente des Westdeutschen Rohholzmarktes. [The elements of the West German market for wood as a primary product.]** Deutscher Forstwirtschaftsrat, Rheinbach bei Bonn. 1957. pp. 24 + 1 gph. [G.]

Analyses figures from official sources, covering chiefly the period since 1946, for the structure and quantity of home supplies and imports, and demand (by semi-finished products), concentrating on a comparison of price movements of wood in general with prices of roundwood, sawn timber (including imports), the raw materials index, German and Swiss trends, etc. Greater stability is much to be desired but price control is not contemplated.

73. Prices

See also Nos. 4413, 4475, 4487, 4488.

4489. **ERNST, C. Vergleich der Messzahlen für Mittelstärken- und Heilbr. Sortierung. [A comparison of price index numbers for assortments according to the mid-diameter and the Heilbronn systems of sorting.]** *Holz-Zbl.* 83 (72), 1957 (917). [G.]

In connexion with the projected revision of price index numbers [cf. *F.A.* 18 No. 3251] the author compares results of sorting (a) long wood and (b) short logs from 8 Spruce stands by (1) the N. German system based on mid-diameter, and (2) the S. German (Heilbronn) system, based on length and top diameter: (2) gave higher mean index numbers for (a) and (1) for (b), but the all-round superiority lay with (2).

4490. **WEDDING, K. U. Die Konkurrenz schwacher Fichten-Nutzholzsportimente. [Assortments competing for small-dimension Spruce wood.]** *Holz-Zbl.* 83 (57), 1957 (737-40). 14 refs. [G.g.]

An analysis of the utilization potential of Spruce stemwood in diameter classes from 7 to 30 cm., working out, on the basis of mean heights, form factors and diameter-quotient series, the mean equivalents for various possible assortments (saw-logs, poles, mining timber, and pulpwood of diameter classes > 20 cm. to < 7 cm. at lower end of bolt) expressed in solid cu.m. without bark. Using

the official price scheme [*Messzahlen*] of 1.12.52, and the Bavarian logging tariff, the most profitable utilization is then worked out (i.e. highest proceeds after deduction of logging costs), and also the effect of shifts in price levels of all or some assortments. In general, stemwood assortments (poles etc.) are more profitable for d.b.h. < 12 cm., but for d.b.h. > 14 cm., where high-grade pulpwood competes with low-grade stemwood, the former is likely to produce the higher net yield. [Cf. *F.A.* 18 No. 3248.]

4491. **SVENDSRUD, A. Prisberegninger for smådimensjoner av gran og furu. [Price calculations for small dimensions of Norway Spruce and Scots Pine.]** *Medd. norske Skogforsøksv.* 12 (3) (No. 46), 1955 (279-316). 12 refs. [Nor.nor.e.e.]

Formulae are given for calculating the reduced gross value (the gross value per cu.m. of a tree minus the 'piece' costs, i.e. costs per tree and log for timber and per tree and 'reis' (a piled measure) for pulpwood). Examples are given in the form of tables and graphs showing the operating-cost data needed in calculating piece costs, and the calculations used in determining the smallest merchantable dimensions, and the limits between assortments, using the crude net value i.e. the gross value with direct operating costs, but not general overhead costs, deducted.

75. Trade Customs and Usages

See No. 4400.

78. Economics of Transport

See Nos. 4126, 4142.

4492. **IANCOV, N. Observații asupra tarifului de transport cu atelajele pentru buștenii de foioase. [The calculation of transport costs for hardwood logs.]** *Rev. Pădurilor* 71 (6), 1956 (394-400). 4 refs. [Rum.russ.g.]

Explains the standard Rumanian tariffs for transport of timber, based on 3 types of road, two seasons of the year, 'hard' and 'soft' (i.e. heavy and light) species, and weight/volume relation for different species. These data are available for firewood, and tables are provided for converting them to apply to the transport of large logs.

79. Economics of the Forest Products Industries

See also Nos. 4662, 4721, 4822.

4493. **The pulp and paper industry in Europe: its trend from 1950 to 1955: its future prospects.** Organisation for European Economic Co-operation, Paris. 1957. pp. 35 + 25. Price 10s. (\$1.50; Fr. 500).

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also No. 4483.

4494. NYLINDER, P. Institutionen för virkeslära. [The Institution for Wood Technology [of the Royal Forestry School, Stockholm].] *Skogen* 44 (11), 1957 (380-1, 403). [Sw.]

Discusses briefly the work of the Institution, founded in 1948 to study the technical properties of wood, assortments and value, scaling, and conversion.

4495. PÊCHE, M. F. Industrie du bois au Congo belge. [The forest industry of the Belgian Congo.] *Bull. agric. Congo belge* 48 (1), 1957 (193-222). [F.]

A comprehensive review by the president of the Belgian Congo timber producers' association, covering all aspects from tree stump to export, with details on species used, local manufacture (plywood factories), economics, forest products research policy etc.

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 3758, 3762-4, 3874, 3924.

4496. A handbook of softwoods. H.M. Stationery Office, London. 1957. pp. vii + 73. Price 8s. 6d.

A companion volume to *A handbook of hardwoods* [see F.A. 17 No. 4376], giving full descriptions of 49 timbers and brief descriptions of 6 more.

4497. KHAN, A. H. Some plants of economic importance found in Pakistan. II. Chir Pine—*Pinus roxburghii* (syn. *Pinus longifolia*). *Pakistan J. For.* 7 (1), 1957 (44-8 + 2 plates). 9 refs.

Describes briefly the silvicultural characters and wood properties, and in some detail the structure and uses of the bark.

4498. Mahogany defined. *Timber of Canada* 18 (4), 1957 (66-7).

Gives details of the U.S. Federal Trade Commission's definitions to prevent the use of 'Mahogany' for species other than the genuine Mahogany (*Swietenia mahagoni*) except those properly designated as Philippine Mahogany (*Shorea*, *Parashorea* and *Pentacme*) and African Mahogany (*Khaya* spp.).

4499. SPALT, H. A., and STERN, W. L. Survey of African woods. II. *Trop. Woods* No. 106, 1957 (65-97). 37 refs.

Descriptions of *Aucoumea klaineana*, *Baikiaea plurijuga*, three *Berlinia* spp., *Celtis* spp., *Chlorophora excelsa*, *Cistanthera papaverifera*, *Cylicodiscus gabunensis*, *Cynometra alexandri*, *Daniella* spp., and *Distemonanthus benthamianus*. [Cf. F.A. 18 No. 2049.]

4500. FERREIRINHA, M. P. Catálogo das madeiras de Moçambique. I Parte. [Catalogue of the timbers of Mozambique. Part I.] *Mem. Junta Invest. Ultramar, Lisboa (Sér. bot.)* No. 2, 1955. pp. 131 + 33 plates. 34 refs. [Port.]

Based on the collection of wood specimens in the Laboratório de Histologia e Tecnologia de Madeiras of the Junta de Investigações do Ultramar [cf. F.A. 17 No. 4369], data are presented on nomenclature, anatomy, physical characteristics and uses of 32 species.

4501. FREITAS, M. C. GRAÇA DE. Estudo das madeiras de Timor. I contribuição. [The timbers of Timor. First part.] *Mem. Junta Invest. Ultramar, Lisboa (Sér. bot.)* No. 3, 1955. pp. 74 + 14 plates. 46 refs. [Port.]

Studies based on the collection at the Laboratório de Histologia e Tecnologia de Madeiras and on a more recent collection sent direct from Timor. Information is given on nomenclature, range, the aspect of the living tree, anatomy and physical properties of the wood and the uses of 14 species.

4502. Specimen woods Nos. 256-8. *Suppls. to Wood* 22 (4-6), 1957. Each pp. 2.

Verawood (*Bulnesia arborea*); Persimmon (*Diospyros virginiana*); and Light Red Seraya (*Shorea smithiana*).

4503. LAMB, G. N. Foreign woods. *Wood, Chicago* 60 (7; 9; 11), 1955 (46; 58; 62); 61 (1; 3; 5; 7; 10), 1956 (44; 38; 12; 12; 54).

Quebracho (*Schinopsis lorentzii*), Rengas (*Melanorrhoea* and *Gluta* spp.); Kenanga (*Canarium odoratum*), Keruntum (*Combretocarpus rotundatus*); Rangu (*Melia excelsa*), Simpoh (*Dillenia* spp.); Sandalwood (*Santalum album*), Bitterwood (*Vatairea lundellii*), Jelutong (*Dyera lowii*), Mangrove (*Rhizophora mangle*); Meranti (*Shorea* spp.); Fiddlewood (*Citharexylum fruticosum*), Brown Penda (*Xanthostemon chrysanthus*); Cape Beech (*Rapanea melanophleas*).

4504. KUKACHKA, B. F. Sen. *Kalopanax pictus* (Thunb.) Nakai. *Rep. U.S. For. Prod. Lab., Madison* No. 1979 (rev.), 1957. pp. 3 + 1 tbl. 2 refs. [P.R. [Cf. F.A. 16 No. 2124.]

4505. Igaganga. [*Dacryodes edulis*.] *Bois For. Trop.* No. 52, 1957 (17-20). [F.]

4506. Samba (Obeche). [*Triplochiton scleroxylon*.] *Bois For. Trop.* No. 53, 1957 (21-4). [F.]

4507. Properties of Australian timbers: Tallowwood. *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 228, 1957 (3-4).

Notes on *Eucalyptus microcorys*, covering habit and distribution, timber properties, seasoning, and a comprehensive list of uses, including 20 applications by railways, builders, miners, farmers and ship-builders.

4508. CLARKE, S. A. Round-up of industrial uses and research needs, including obstacles to wider use [of *Eucalyptus*: with discussion and recommendations]. *Final Rep. World Eucalyptus Conf., Rome 1956, 1956 (44-57)*. [E.]

Discusses, in particular, the unfavourable characters of Eucalypt wood and the special techniques developed to overcome them in logging, saw-milling, seasoning and industrial or constructional use.

4509. CROMER, D. A. N. **The value of Eucalypts—world-wide, particularly Australia [with discussion].** *Final Rep. World Eucalyptus Conf., Rome 1956, 1956* (3-18 + 1 map). 13 refs. [E.]

Includes tables showing extent of various forms of utilization (including pulping) for numerous species, the proportion of Eucalypt wood in the total wood consumption of Australia and some information on plantings (infrequent) of Eucalypts for other uses such as shelterbelts or soil fixation, on growth and yields etc., and on the extent and success of their introduction in other countries.

811. Structure, Identification

See also No. 4438.

4510. VIKHROV [VIHROV], V. E., and MOSKALEVA, V. E. **Wood anatomy and wood technology.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust. No. 3091, 1956.* pp. 20 + 8 photos, 1 set of dgms. 58 refs. Transl. by M. Slade from *Trud. Inst. Les. No. 9, 1953* (70-88). [See *F.A. 15 No. 4003.*] Limited distribution.

4511. STERN, W. L. **Guide to institutional wood collections.** *Trop. Woods No. 106, 1957* (1-29).

Summarizes information from 66 replies from 5 continents, covering foundation, staff and research workers, number of species and genera represented, botanical voucher cover, important collections, specialization, periodicals or serials published, and facilities for the loan or exchange of samples and slides.

4512. MARIAN, J. E., and SUCHSLAND, K. **Experimental investigation of gluing and finishing problems though application of fluorescence microscopy in incident light.** *For. Prod. J. 7* (2), 1957 (74-7). 5 refs.

A description of the technique, consisting chiefly of the addition of highly diluted fluorescent dyes to the adhesive or finish before application, and the staining of the wood with such dyes after gluing or finishing, for observation under incident ultra-violet light. Some photomicrographs (of *Pinus sylvestris*) are presented.

4513. ATACK, D., and SMITH, K. C. A. **The scanning electron microscope: a new tool in fibre technology.** *Pulp Paper Mag. Can. 57* (3), 1956 (245-51). 18 refs.

Studies of surface structure of mutilated fibres (e.g. such as occur in groundwood pulp) at high resolution and depth of field present a very difficult problem. The development of the scanning electron microscope has made possible the examination of such fibres *in situ* to a resolution of 250Å and at a high depth of field. Sectioning or replication of the specimen is not required. A brief critical survey of other techniques is presented to indicate the type of supplementary information obtainable from this new instrument. *From authors' summary.*

4514. LEE, C. L. **A method of eliminating curl in wood sections.** *Trop. Woods No. 105, 1956* (5-7). 8 refs.

As the knife passes through the block, the section is pressed against the surface of the knife with a camel's-hair brush. As soon as a section is cut, it is placed in a Petri dish with enough 70% alcohol to cover it completely. After several sections have been cut and placed in the alcohol, they are transferred to a second Petri dish which has only a few drops of 70% alcohol or just enough to keep the sections from drying. The sections should then be neatly arranged and flattened with the camel's hair brush and kept covered over night to ensure that they remain permanently flattened. In the morning distilled water is gently poured into the container and sections will then float and can be removed for staining.

4515. KOBAYASHI, Y. [Some new data on the anatomical characters of softwoods.] *J. Jap. Wood Res. Soc. 2* (3), 1956 (119-20). 2 refs. [Jap.e.] P.R.

The author found the following new features: (1) Koyamaki (*Sciadopitys verticillata*) has, though rarely, vertical parenchyma; (2) fusiform rays were observed in Sawara (*Chamaecyparis pisifera*); (3) occasional ray tracheids in Nezuko (*Thuja standishii*), Hinoki (*Chamaecyparis obtusa*), Hinoki-asunaro (*Thujopsis dolabrata* var. *hondai*) and *Thuja plicata*.

4516. BERKEL, A. Sığla ağacı (*Liquidambar orientalis* Mill.) odununun makroskopik özellikleri ve anatomik struktürü hakkında araştırmalar. [A summary of the anatomical structure of *L. orientalis*.] *Istanbul Üniv. Orm. Fak. Derg. 5A* (1/2), 1955 (1-18). 12 refs. [Turk.e.e.]

The English summary covers nomenclature, distribution, and macroscopic and microscopic characters (illustrated).

4517. DUCHAIGNE, A., and CHALARD, A. Contribution à l'étude des nouvelles espèces indochinoises de *Polyosma* (Saxifragacées au sens large, Escalloniacees des nouvelles classifications). [Contribution to the study of new Indochinese species of *Polyosma* (Saxifragaceae *sensu lato*, Escalloniaceae of newer classifications).] *Bull. Soc. bot. France* 103 (9/10), 1956 (582-6). 10 refs. [F.] O.B.D.

An anatomical study of the stem of *P. annamensis*, *P. nhatrangensis*, *P. aulacocarpa*, *P. poilanei* and *P. turfosa*. [Cf. *F.A. 16 No. 3848.*]

4518. CARLQUIST, S. **Wood anatomy of Mutisieceae (Compositae).** *Trop. Woods No. 106, 1957* (29-45). 24 refs.

A detailed consideration of the significantly varying features of 22 genera of this tropical and sub-tropical American tribe, with reference to the phylogeny of Compositae and the unresolved question whether this family was originally herbaceous or woody.

811.1. Anatomical Elements and Tissues

See also Nos. 3698, 3769, 4513, 4515, 4527, 4532, 4542-3, 4690-1, 4756.

4519. SVENSSON, A. Å. **The surface fine structure of conifer cell walls.** *Arkiv för Kemi, Stockholm*

10 (3), 1956 (239-50). 11 refs. [E.e.] O.R.S.

Results of an electron-microscope study on fibres from Spruce pulped in different ways are illustrated in photomicrographs.

4520. EMERTON, H. W., and GOLDSMITH, V. The structure of the outer secondary wall of Pine tracheids from kraft pulps. *Holzforschung, Berlin* 10 (4), 1956 (108-15). 14 refs. [E.e.g.] P.R.

It was found that light mechanical treatment of kraft-pulped tracheids of *Pinus patula* and *P. caribaea* partially removed large areas of an outer layer, 760-2120Å thick, which was identified as the outer secondary wall. Under the electron microscope this showed two systems of parallel fibrils, spiralling in opposite directions, symmetrically about the axial direction at an angle of ca. 60°. In addition, there are bundles of non-spiralling longitudinal fibrils at the corners of the tracheids, sometimes twisted about one another. A new model of cell-wall structure is proposed in the light of this research. *From authors' summary.*

4521. Low angle scattering of X-rays by wood. *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (86).

Attention has been drawn to the changes in the scattering diagrams that accompany the shrinkage and swelling of wood (particularly tension wood). Results indicate that the scattering angle is not attained on re-swelling in water. Provisionally these results have been interpreted to mean that the micelles aggregate to form larger units in drying, and that this change is to some degree irreversible.

4522. BOUTELJE, J. B. Beräkning av medellängden av fibermaterial i sågspån. [Calculating the mean length of fibres in sawdust [and other small wood-waste particles].] *Svensk PappTidn.* 60 (8), 1957 (299-304). 5 refs. [Sw.sw.e.g.] P.R.

In the method described the sample is weighed, and divided into a number of fractions by screening, the fractions are weighed, and the length in the fibre direction of a number of chips from each fraction is measured. The equation derived for the average length of the fibre material (fibres and fragments of fibres) is

$$m = \frac{G_s}{\sum_{v=1}^n \frac{G_v (M + \bar{l}_v)}{M \bar{l}_v}}$$

where m is the average length of fibre material, G_s weight of sample, G_v weight of fraction v , $\bar{l}_v$ average length of chips in fraction v , M average fibre length of the timber and n number of fractions. When the value for M can be found in literature the method is preferable to the more usual one of macerating the material and measuring the fibres thus isolated. *From author's summary.*

4523. JACKSON, L. W. R., and GREENE, J. T. Method for fiber measurements. *J. For.* 55 (4), 1957 (300). 1 ref.

To separate fibres, strips of wood 2 mm. thick, 8 mm. wide and 1 in. long are placed in vials, equal parts of 5% HNO₃ and 5% H₂CrO₄ are added, and

the vials are put into an oven at 35° C. for maceration for 12-24 hours, according to wood density. The acid is then removed and replaced with an aqueous solution of formaldehyde. When shaken gently the fibres separate. Instructions are also given for making permanent and temporary mounts.

4524. JANE, F. W. Perforated vertical tracheids in *Sequoia sempervirens* Endl. *New Phytol.* 55 (3), 1956 (367-8 + 2 photos). O.R.S.

Perforated tracheids (illustrated in photomicrographs) were found in the secondary xylem, in a radial longitudinal section, in a single radial line, and affecting two growth rings. The origin of the specimen is unknown and no more is available for examination. It is probable that the area in which they occur is compression wood, as there is oblique checking on the radial walls of some late-wood tracheids.

4525. WUN, T. H. [Determination of the length and thickness of Bamboo fibres, Chekiang Province.] *For. Sci., Peking* 1 (1), 1955 (122-7). [Chin.]

Shows, in tables and graphs, the length and diameter, with size frequencies, of fibres from the 3rd to 7th internodes of culms of 25 Bamboo species (scientific names given).

4526. KENNEDY, R. W. Fibre length of fast- and slow-grown Black Cottonwood [*Populus trichocarpa*]. *For. Chron.* 33 (1), 1957 (46-50). 11 refs.

The lengths of fibres from fast- and slow-grown trees were measured at comparable heights and ages. Fibre length was found to vary directly and significantly with both growth rate and age from pith. An additional investigation showed that fast-grown stool-shoots had longer fibres than slow-grown ones from the same stump. The mechanisms regulating fibre length in trees are discussed briefly. *From author's summary.*

811.2 Special Features and Abnormal Structure

See also Nos. 4521, 4568, 4572.

4527. WALEK-CZERNECKA, A., and SMOLIŃSKI, M. Anatomia drewna bukowego normalnego i ciagliwego. [Anatomy of the normal and tension wood of Beech.] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 11, 1956 (21-69). 37 refs. [Pol.pol.russ.f.]

Presents in photographs and tables the results of an anatomical study of sections taken from 4 *Fagus sylvatica* stems growing on the same site. In normal wood, libriform fibres were completely lacking; the ground tissue consisted of fibre-tracheids with fairly large bordered pits; vessel perforations were simple or scalariform, the latter less numerous but (contrary to published descriptions) occurring in the large vessels; rays were homogeneous or heterogeneous, in the latter case with marginal cells ≥ twice as high as the horizontal cells. The author was unable to confirm the presence of terminal parenchyma as recorded by Chow [see *F.A.* 9 No. 290]. In tension wood the fibres were longer and narrower, the vessels less numerous, and the proportion of parenchyma higher; within the annual ring the gelatinous fibres could be isolated, or in small groups, or in large masses (most frequently in the

middle of the ring but sometimes confined to the early wood and sometimes occupying nearly the whole ring except for a narrow zone of late wood). In a few exceptional cases tension wood was observed on opposite sides of the stem in the same annual ring.

4528. MENON, P. K. B. **Vertical canals in Penaga.** *Malay. Forester* 20 (2), 1957 (99 + 2 photos). 4 refs.

Describes the occurrence of vertical intercellular canals, usually $\leq 2-3$ in. in height and irregular in distribution, that are apparently a characteristic feature of *Mesua ferrea* wood, though not mentioned in the literature. Although the persistence of canals in *M. ferrea* suggests normal resin canals, their irregular distribution suggests a traumatic origin.

811.4. Growth Rings. Early and Late Wood

See also Nos. 4532, 4553.

4529. JAYME, G., and BAUER, G. Die Unterscheidung von Früh- und Spätholzfasern durch sekundäre Fluoreszenz. [Distinguishing early- and late-wood fibres by means of secondary fluorescence.] *Holzforschung, Berlin* 11 (1), 1957 (16-8). 15 refs. [G.g.e.] P.R.

Thiazol Yellow and especially Thioflavin S give more distinct differences than the Brilliant Dianil Green conventionally used. With Thioflavin S fluorescence of the early-wood fibres is yellow-green and that of the late-wood fibres is blue.

4530. BENIĆ, R. Učešće kasnog drveta u godu jelovine (*Abies alba* Mill.). [Proportion of late wood in the annual rings of *A. alba*.] *Šum. List* 80 (11/12), 1956 (376-86). 5 refs. [Croat.croat.]

Measurements were carried out in selection forest at Zalesina on (A) 10 sample stems (mean age 138 years, mean d.b.h. 56 cm., mean height 35.5 m.) on a silicate subsoil, and (B) 10 sample stems (mean age 176 years, mean d.b.h. 48 cm., mean height 25.3 m.) on a limestone subsoil, with humus soil; for both stands the site quality was 2, the slope 35° and the aspect S.W. The measurements were made on discs cut at a height of 5.3 m. above ground. Ring width in (A) varied from 1.10 to 7.80 mm. (mean 2.64 mm.); in (B), from 0.10 to 5.40 mm. (mean 1.50 mm.); the modal values for (A) and (B) were almost equal (ca. 1.35 mm.). The mean width of late-wood was 0.74 mm. in (A) and 0.42 mm. in (B), so that the late-wood % was almost identical (27.95 and 27.76% respectively). Statistical treatment of the results finally yielded only one equation for (A) and (B), viz. $y = 0.2789x$, where y is width of the late-wood and x is ring width, the coefficient of correlation being very high ($r = 0.976 \pm 0.0008$). The maximum proportion of late-wood was found for ring-width values round 1.5 mm.

811.5. Sapwood and Heartwood

4531. BEM, A., and ERDEŠI, J. O mogućnosti procene učešća obojene srži u dubecnom stablu poljskog jasena u šumama Bosutskog bazena. [Possibility of estimation of the proportion of brown heart in the stems of *Fraxinus angustifolia* in the

forests of the Bosut basin.] *Šumarstvo* 8 (12), 1955 (757-64). [Serb.serb.e.f.]

The authors have worked out tables based on the results of BeniĆ's investigation [see *F.A.* 18 No. 3299] giving the probable % of brown heart at a height of 2.4 m. These table values were found to be much greater than those determined experimentally by the authors on *F. angustifolia* in the Bosut basin.

811.7. Phloem; Bark

See Nos. 4497, 4771.

812. Physical and Mechanical Properties

See also No. 4510.

4532. PECHMANN, H. VON. Untersuchungen über die Festigkeit und Struktur von Eschenholz aus einigen südwestdeutschen Waldgebieten. [Strength and structure of Ash wood from some forest regions of south-western Germany.] *Forstwiss. Cbl.* 75 (9/10), 1956 (488-504). 10 refs. [G.g.]

Specimens from (1) the Swabian Jura, (2) the south-western Black Forest and (3) the Rhine flood-plain near Lahr were tested and compared for physical and mechanical properties. Differences were found not only in the trees of different regions, but, owing to variations in site and silvicultural treatment, in trees from the same region. The best strength properties were shown by specimens from (3), but it is likely that with proper management equally good timber could be grown in (1) and (2). Ring width proved a valuable factor in estimating the properties of Ash. The space taken up by the fibre walls in cross-section is decisive for judging strength.

4533. NEDBAL, F. K. pěstování jasanu. [The growth of *Fraxinus excelsior*.] *Lesn. Práce* 35 (9), 1956 (389-94). [Cz.]

Tabulates the mean, maximum and minimum values of the following characters of *F. excelsior* wood obtained from 6 different localities in Bohemia: mean ring width; density; compression strength; bending strength; modulus of elasticity; work to failure, and hardness (end-grain, radial and tangential face). These data show that a minimum ring width of 3 mm. is required to produce a wood that can be used for most purposes. Localities where this minimum width cannot be reached should not be considered for Ash growing.

4534. BOYD, J. D., and KINGSTON, R. S. T. **Physical and mechanical properties [of *Eucalyptus*].** *Final Rep. World Eucalyptus Conf., Rome 1956*, 1956 (147-8). [E.]

Discusses, with tables, for 45 species, shrinkage values, strength grouping (3 groups) including basic working stresses and relations to density; also strength/weight ratios for 19 species, comparing Australian and S. African-grown timbers, and methods of testing and sampling, stressing the great variability of properties within each species.

4535. HERINGER, E. PAULO. Alméciga do Rio Doce. Propriedades físicas da madeira da *Tratinickia ferruginea* Kuhl. [Physical properties of the wood of *T. ferruginea*.] *Boletim de Agricultura*

do Departamento de Produção Vegetal, Secretaria da Agricultura do Estado de Minas Gerais, Belo Horizonte 4 (7/8), 1955 (27-46). [Port.] L.S.

A description of the tree, notes on its silvicultural characters, and data on some physical properties of the wood, viz. sp. gr., shrinkage and swelling.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See Nos. 4764, 4767.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 3772, 4521, 4547, 4592, 4680-2, 4724, 4737, 4763, 4766.

4536. MATHEWSON, J. S., and BERGER, P. J. Comparison of three methods of determining whether Southern Pine poles are well air seasoned. *For. Prod. J.* 7 (5), 1957 (174-7).

Readings of an electric moisture meter, m.c. determinations by distillation of borings, and readings of an ohmmeter (megger) measuring the resistance between two nails driven into the poles $3\frac{1}{2}$ in. deep and 25 ft. apart, were compared. The first two methods corresponded well within the critical range, and a m.c. of 20-30%, considered suitable for creosote treatment, generally corresponded to readings of 2.5-3.5 megohms by the third method.

4537. UYEMURA, T. [Effects of the thickness of wood materials on the readings of electrical moisture meters.] *J. Jap. Wood Res. Soc.* 2 (1), 1956 (49-52). 6 refs. [Jap.e.e.] P.R.

Graphs show how the readings of electrical moisture meters (several types being tested) are affected by the thickness of the specimen under test and by the nature of the supporting table.

4538. HART, J. A., and GALLAY, W. The aquatel—a new moisture meter for paper. *Pulp Paper Mag. Can.* 58 (3), 1957 (195-200).

Capable of continuous measurement on the moving web or on stationary samples, the meter measures the electrical resistance between two electrodes on the same side of the sheet. By the use of A.C., non-uniform contact pressures and static are avoided and the amplified pure resistance is measured by cancelling out capacity. The meter is very insensitive to changes in basis weight and other effects for which calibration is easy. A range of 3-10% m.c. is measured to ca. $\pm 0.2\%$.

4539. KITAMURA, H. [Studies on the physical properties of Bamboo. VII. Moisture loss from the various surfaces.] *J. Jap. For. Soc.* 38 (2), 1956 (78-83). 6 refs. [Jap.e.e.]

In tests on *Phyllostachys edulis*, *P. reticulata*, *Pinus densiflora*, *Cryptomeria japonica*, *Fagus crenata* and *Kalopanax septemlobum*, air-seasoned blocks ($10 \times 10 \times 40$ mm.) were immersed in water for 6 months until saturated, and then coated with paraffin. The moisture loss (mg./sq. cm. up to 5 hours) was measured in a desiccator after the paraffin coating had been sliced off one or more surfaces. (1) The

relation of loss to elapsed time appeared in all cases as a straight line or parabolic curve. (2) Loss from the tangential section was lower from the outer than from the inner (nearer pith) side, a difference probably related to the distribution of the vascular bundles. (3) Loss from all surfaces was lowest for *P. edulis* and highest for *Pinus densiflora*, *F. crenata* and *K. septemlobum*. (4) Loss was in all cases highest from the cross section and lowest from the cortex. *From author's summary.*

4540. THOMAS, A. V., and PILLAI, P. K. B. Shrinkage of Malayan timbers. *Trade Leaflet Malay. For. Serv. No. 21* [n.d.] pp. 2. Price 50 cents (1s. 3d.).

Tabulated data on 72 species.

4541. KITAMURA, H. [Studies on the shrinkage of important timbers. III. *Pinus pentaphylla* Mayr from Gunma prefecture.] *J. Jap. Wood Res. Soc.* 2 (4), 1956 (137-41). 2 refs. [Jap.e.e.]

[Cf. F.A. 18 No. 895.] The mean moisture content of the green wood (20 days after felling) was 64%; and at the beginning of the tests, heartwood $28.00 \pm 0.33\%$, sapwood $34.30 \pm 0.41\%$; initial density values: heartwood 0.568 ± 0.008 , sapwood 0.536 ± 0.003 . The shrinkage % (S) depended on the duration of test (60-400 min.) as shown by the equation $S = t/(a + bt)$, where t is duration of test in min., and a and b are constants. The relationship between S and m (moisture content) is $S = ae^{bm}$, except in the tangential direction of heartwood and sapwood and in the radial direction of sapwood, for which the formula $S = ae^{bm} + cm + d$ should be applied. The ratio of T (tangential shrinkage) to R (radial shrinkage) decreases in time, becoming 1.8 at oven-dryness. The ratio T to L (longitudinal shrinkage) is very large after a few hours, falling to ca. 30 when oven-dry. The oven-dry densities are: heartwood 0.510 ± 0.006 , sapwood 0.422 ± 0.003 .

4542. HALE, J. D. The anatomical basis of dimensional changes of wood in response to changes in moisture content. *For. Prod. J.* 7 (4), 1957 (140-4). 15 refs.

Suggests that these are chiefly caused by dimensional changes in the vertical cells (prosenchyma) so that, regardless of the restraining effect of rays, radial shrinkage is less than tangential, and demonstrates the occurrence of microscopical radial seasoning checks originating at the junction of rays and thick-walled prosenchyma, sufficiently large to affect mechanical properties. The need for anatomical studies of wood properties as affected by moisture content is stressed. *From author's summary.*

4543. MCINTOSH, D. C. Transverse shrinkage of Red Oak and Beech. *For. Prod. J.* 7 (3), 1957 (114-20). 27 refs.

Discusses the effect of different shrinkage rates of broad rays, fine rays, and 'rayless' wood, and of early and late wood, on tangential/radial shrinkage ratios, supplementing and interpreting earlier findings [cf. F.A. 17 No. 1956; 16 No. 4502].

4544. VORREITER, L. The swelling of timber as a function of a number of variable factors, particularly

temperature and timber dimension. *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3059, 1956. pp. 21 + 1 dgm. + 16 gphs. 25 refs. Transl. by H. E. Kijlstra from *Holz Roh- u. Werkstoff* 13 (8), 1955 (301-12). [See F.A. 18 No. 2097.] Limited distribution. P.R.

4545. Sorption studies. *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (87-8).

Further tests have been made on the sorptive and wetting characteristics of *Araucaria klinkii* [cf. F.A. 18 No. 2085]. An investigation of the effect of particle size on the heat of wetting showed that the heat evolved on wetting dry wood increased from 18.9 cal./g. for unground wood to 20.6 cal./g. for wood passing 60 mesh size. Measurements have also been begun on the sorption characteristics of components isolated from *Eucalyptus regnans*. Heat of wetting varied from 36 cal./g. for the non-cellulose polysaccharide fraction to 8 cal./g. for methanol lignin. The heat of wetting of lignin varied markedly with the method of preparation, the values for Klason and periodate lignin being twice that for methanol lignin.

4546. KELSEY, K. E. The sorption of water vapour by wood [of *Araucaria klinkii*]. *Aust. J. appl. Sci.* 8 (1), 1957 (42-54). 17 refs. P.R.

The sorption of water vapour by Klinki Pine wood was studied in the absence of air at 10, 25, 40 and 55° C., quartz helix balances being used to determine the moisture content. Both the equilibrium moisture content and the amount of sorption hysteresis at a given relative vapour pressure decreased with increasing temperature. The isotherms were compared with those obtained from theoretical treatment and it was found that the number of points where strong binding occurs, appears to decrease with increasing temperature, and was greater on desorption than on adsorption. *From author's summary.*

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 3724, 4147-53.

4547. LUKIĆ-SIMONOVIĆ, N., and SIMONOVIĆ, M. Dijagram za praktično preračunavanje zapreminskih težina prosušenog drveta pri proizvoljnoj vlažnosti. [A graph for the practical determination of the density of wood dried to any moisture content.] *Šumarstvo* 8 (12), 1955 (735-40). [Serb.e.f.]

The ordinates of the graph are values of nominal density at 15% moisture content (d_{15}), while the abscissae are values of nominal density (d_u) at any moisture content (u). Assuming that the linear equation $d_{15} = d_u [1 + (1 - k_v)(15 - u)/100]$ where k_v is the coefficient of volume shrinkage (evaluated from the total volume shrinkage and the m.c. at fibre-saturation point), holds for the m.c. range 10-22%, the authors draw a family of straight lines representing the above equation for $u = 10, 11 \dots 22\%$. The graph yields d_{15} values if d_u and u are known, or d_u values if d_{15} and u are known; every value of k_v requires a separate graph.

4548. LIMAYE, V. D., and SEN, B. R. Weights and specific gravities of Indian woods. *Indian For.*

Rec. (n.s.) Timb. Mech. 1 (4), 1953 (1956) (75-107 + 1 photo).

Gives tabulated data for 300 spp. Weights are given in lb./cu. ft. for green logs and for seasoned wood (m.c. 12%), and sp. gr. for four combinations of m.c. and volume.

4549. FRY, G., and CHALK, L. Variation of density in the wood of *Pinus patula* grown in Kenya. *Forestry* 30 (1), 1957 (29-45). 6 refs.

The sp. gr. was determined for the individual rings of twenty-three 13-year-old stems of *Pinus patula* grown in Kenya, and also separately on the early wood (e.w.) and late wood (l.w.) of six rings. Significant correlations were found between sp. gr. and both ring width and age of the ring from the pith. The effect of ring width was slight with more than six rings to the inch. A comparison with Turnbull's data from South African trees of the same species [cf. F.A. 9 No. 920] confirmed his results only in the first nine rings from the pith. The mean sp. gr. of the e.w. in five rings was 0.368 compared with 0.469 for the l.w. This high value for the e.w. and the small difference between e.w. and l.w. were due to the thickness of the walls in the e.-w. tracheids. Similar thick-walled e.-w. tracheids were observed in Kenya species of *Juniperus* and *Podocarpus*. *Authors' summary.*

4550. ANDERSEN, K. F., and MOLTESEN, P. Teknologiske undersøgelser af bølgeved: rumvægt og dens variation. [Technological research on Beech: density and its variation.] *Dansk SkogvFören. Tidsskr.* 40 (12), 1955 (592-611). 17 refs. [Dan.e.]

Oven-dry density (r_0) of 2122 samples from 98 trees from different parts of Denmark was measured. Mean value of r_0 was 0.6949 and values ranged from 0.560 to 0.820. Material from Bregentved (ca. 1400 samples) showed that the mean value was highest (0.713) for the light thinning grade, B, lowest (0.683) for the normal grade, C, and intermediate (0.692 and 0.698) for the heavy grades, D and F. Minimum density was found at an annual ring width of 4 mm., with a decrease of 7% from a width of 1 mm. Density decreased significantly with increasing sampling height. The variation of density with thinning is too small to have any considerable effect on the dry-matter production under different thinning schedules. Analyses of complete stems of 80-year Beech showed considerable irregularities in density, probably attributable to local formation of reaction wood. Significant variations in density were found between trees from 4 different localities; there appeared to be a relationship between high temperatures, especially in late winter and spring, and high density values. Other research, mainly European, is summarized. It is concluded that technological properties of Beech are not much affected by environment.

812.7. Strength Properties

See also Nos. 4592, 4595, 4625, 4646, 4648-50, 4691, 4698.

4551. BELLOSILLO, S. B. Fabrication of small clear specimens of timber for strength tests. *Rep.*

U.S. For. Prod. Lab., Madison No. 2074, 1957. pp. 10 + 10 photos + 5 dgms. 2 refs. P.R.

Detailed illustrated description of both the initial preparation of test specimens and the preparation of individual test-pieces for bending (static and impact), compression ($\perp$ and $\parallel$), density, nail-pull, and hardness tests, as used at Madison.

4552. KOLLMANN, F. Messung der statischen Festigkeitseigenschaften von Hölzern. I & II. [Measurement of the static strength properties of woods. I & II.] *Reprs. from Archiv für Technisches Messen [München]* No. 251, 1956. pp. 4; No. 253, 1957. pp. 4. 15 refs. [G.] P.R.

(I) Describes the principles and standard methods of measuring tensile strength, cleavage resistance, and compression strength (including crushing strength of long struts). (II) Deals with measurement of bending strength, torsion strength, and shear strength.

4553. Timber mechanics: silvicultural tests. *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (88).

Ten trees of *Pinus pinaster* and 20 of *P. radiata* from W. Australia, including some treated with $ZnSO_4$ and showing a subsequent marked increase in growth rate, were studied. Strength of early wood and also that of late wood, considered separately, were independent of the growth rate and silvicultural factors. The strength of timber in specimens including a number of growth rings is apparently related to the % of late wood rather than to variations in strength of early wood or of late wood respectively.

4554. STEWART, A. M., and KLOOT, N. H. The mechanical properties of Australian, New Guinea and other timbers. *Bull. Commonw. sci. industr. Res. Organ.* No. 279, 1957. pp. 71. 21 refs.

Mechanical properties are tabulated for 100 timbers—85 Australian, 13 from New Guinea, one Malayan and one from Borneo. The text comprises explanatory notes to facilitate use of the tables by wood technologists. *Authors' summary.*

4555. SHIGEMATSU, Y. [Tests on tropical woods. Part 1. Mechanical properties of 7 Philippine woods and 2 Tai woods.] *Scientific Reports of the Saikyo University (Agriculture)*, Kyoto No. 8, 1956 (20-5). 8 refs. [Jap.e.e.]

Results of mechanical tests are shown in tables and graphs. Compressive strength, bending strength, Young's modulus in bending, and hardness are related to specific gravity, *Dipterocarpus* spp. and *Tectona grandis* being stronger than timbers of the Lauan group (*Shorea*, *Parashorea* and *Pentacme* spp.). Relation of sp. gr. to absorbed energy in impact bending, shear strength and cleavage resistance is not clear. Anatomical structure also affects strength. The correspondence between types of failure in bending (illustrated) and values of absorbed energy, and bending and compressive strengths is interpreted as the effect of the wood structure. *From author's summary.*

4556. CHEN, K. S. *et al.* [Report on the strength properties of [the wood of] *Cunninghamia lanceolata* in south-central China.] *For. Sci., Peking* 1 (1), 1955 (98-113). [Chin.chin.]

Results of tests, using an Amsler 4-ton Universal machine, on $2 \times 2 \times 2$, $2 \times 2 \times 3$ and $2 \times 2 \times 100$ -cm. specimens, green and oven-dry, are tabulated; also some physical properties. Hunan provenances proved strongest and are reputed to be the most durable.

4557. SEKHAR, A. C., and NEGI, D. D. S. Studies on Izod values of some Indian timbers. *Indian For. Bull. (n.s.)* No. 201, 1955 (1957). pp. 20 + 6 gphs., 1 dgm., 1 photo. 7 refs.

Gives test data on 120 species. The relationships between Izod value and sp. gr., and between Izod values and maximum height of drop in impact bending are discussed.

4558. REDLOV, T. Incovoiera prin șoc a grinzilor de lemn. [Impact bending of wooden beams.] *Rev. Pădurilor* 71 (7), 1956 (432-9). 1 ref. [Rum.russ.g.]

Gives 5 nomograms for determining the impact-bending strength of beams of different dimensions, and discusses their construction and use.

4559. OGATA, S. [Historical studies on the determination of the hardness of wood in Japan.] *J. Jap. Wood Res. Soc.* 2 (3), 1956 (114-8). 20 refs. [Jap.f.] P.R.

Besides the generally accepted methods (Brinell, Chalais-Meudon, Janka, Krippel, Hoeffgen, Büsgen) of which Janka and Brinell have been most widely used for the last 45 years in Japan, there exists a purely Japanese method (K. Moroto, 1909) in which a steel cylinder ending in a hemisphere of 3 cm. diam. is forced under a load of 2000 kg. (radial or tangential surface) or 4000 kg. (end-grain surface) against a $6 \times 6 \times 6$ cm. test-piece. According to the Japanese standard now in force (JIS A 1011), the hardness of wood is measured by the force (in kg.) required to produce an indentation $1/\pi$ mm. (ca. 0.32 mm.) deep by a steel ball of 1 cm. diam.

4560. KOLLMANN, F. Untersuchungen über die Querkzugfestigkeit der Hölzer. [Tensile strength of wood across the grain.] *Forstwiss. Cbl.* 75 (9/10), 1956 (304-18). 7 refs. [G.g.]

Twenty different species were tested for tensile strength across the grain (t.s. $\perp$) at moisture content (m.c.) of (1) 12%, and (2) a little over fibre-saturation point. T.s. $\perp$ in the radial direction averaged twice as high as that in the tangential; the scatter of individual values was relatively great. Values for t.s. $\perp$ rise parabolically with green density. A systematic pattern of failures was found in the specimens. The fall in t.s. $\perp$ with m.c. was investigated and compared with the fall of t.s. $\parallel$, under the same conditions. While t.s. $\parallel$ reaches a maximum between 6 and 10% m.c., values for t.s. $\perp$ fall regularly and gradually from the oven-dry condition to fibre-saturation point, at a rate of 1.5-2% for every 10% increase in m.c.

4561. SEKHAR, A. C., and RAWAT, B. S. **Torsional properties of some Indian timbers.** *Indian For. Bull. (n.s.)* No. 202, 1956. pp. 14 + 1 photo, 2 gphs. 11 refs.

Gives test data on 68 species.

4562. SEKHAR, A. C., and RANA, R. S. **Nail and screw holding power of Indian timbers. Part 1.** *Indian For. Rec. (n.s.) Timb. Mech.* 1 (5), 1956 (109-22). 6 refs.

Describes test methods used and gives tabulated data for 41 spp.

4563. CHELVARAJAN, B. K. **Nail-holding power of a few Mysore woods on a Mohr and Federhaff universal testing machine.** *Indian For.* 83 (4), 1957 (260-4 + 2 photos, 1 gph.). 4 refs.

This machine can be adapted to test nail-holding power, and data are given from tests on 34 Indian species. In general there is a direct relation between sp. gr. and nail-holding power.

4564. NAKAMURA, G., AOYAMA, T., and SASTO, M. [Research materials. Some experiments on nail withdrawal-resistance in wood.] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (273-9). [Jap.]

Data are tabulated and graphed for 9 species, including *Cryptomeria japonica*, *Distylium racemosum*, *Fagus crenata*, *Fraxinus commemorialis*, *Pinus densiflora*, *Quercus serrata* and *Shiia cuspidata*, using 4 lengths of wire-drawn and, for 2 hard species, specially tempered nails, all driven in radially for two-thirds of their length into oven-dried wood and extracted both by hand and by machines.

4565. ŁAWNICZAK, M. **Influence of variations in the moisture content of wood on its nail holding power.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3303, 1956. pp. 7 + 2 dgms. 8 refs. Transl. by H. Subak from *Sylvan* 100A (1), 1956 (29-35). [See *F.A.* 17 No. 4416.] Limited distribution. P.R.

812.8. Workability. Working Properties

4566. McVEIGH, J., and GANESAN, K. **Standard woodworking tests.** *Ceylon For. (n.s.)* 2 (4), 1956 (201-5).

Describes the testing methods now for the first time being operated in Ceylon, and gives results of tests on working qualities of *Chikrassia velutina*.

813. Wood Chemistry

See also Nos. 4153, 4744 et seq.

4567. MARCON, Y. **Les activités du Centre Technique Forestier Tropical en relations avec la chimie. [Work done at the Centre Technique Forestier Tropical in connexion with chemistry.]** *Chim. et Industr.* 77 (3), 1957 (609-13). [F.] D.S.I.R.

Describes the work done by the section of chemistry, cellulose, and wood preservation.

813.1 Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 3724, 4545, 4592-3.

4568. **Chemistry of tension wood.** *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (87).

Composite specimens of (a) tension wood, (b) the wood opposite the tension wood, and (c) the side wood, from 4 trees of *Eucalyptus goniocalyx*, have been analysed. As in other species, (a) was found to have a high α -cellulose and low lignin content compared with (b) and (c), and abnormally large amounts of polysaccharide which is richer in galactose residues than the (b) and (c) polysaccharides. The ultra-violet absorption spectrum of (a) showed the characteristics of mature wood lignin to a greater extent than (b) and (c).

4569. SIMIONESCU, C., and GRIGORAS, M. Über die Veränderungen in der chemischen Zusammensetzung des Holzes verursacht durch den Angriff von Pflanzenkrebs. [Changes in the chemical composition of wood caused by canker disease.] *Pap. ja Puu* 39 (5), 1957 (283-4). 1 ref. [G.] P.R.

In a previous paper (*Buletinul Inst. Politehnic Lasi* 2 (1/2), 1956), the authors described a study of Pine wood attacked by *Melampsorella cerastii* in which they found a high degree of lignification and a reduction in cellulose content in the neighbourhood of the attack, and, in the bark, or between it and the wood, considerable amounts of resin without any change in the tannin content. The bark showed a reduced content of pentosans and water-soluble substances. In the present study, a large canker on Beech was examined. The cellulose content in the cankered wood was only 37-47% compared with > 50% in the sound wood, and showed considerable variation. The sum of the lignin plus the cellulose appeared to remain fairly constant at 68.20-70.22%. Contents of warm-water and 1% NaOH extractives and of pentosans were higher in the cankered wood.

4570. ELLIS, E. L. **The spectrochemical analysis of *Abies grandis* (Dougl.) Lindl. with particular reference to decay by *Echinodontium tinctorium* (Ellis) E. and E.** *Abstr. of thesis, in Dissert. Abstr.* 17 (3), 1957 (465). O.R.S.

Collections were made from 113 trees in the major range of this species, both west (where *E. tinctorium* is virtually unknown) and east of the Cascades. Selected samples were analysed for Ca, Mg, K and Na, by flame spectrophotometry and for 33 other elements spectrophotographically. The analytical procedure is described. Major conclusions are: (1) Significant differences existed in mean values of elements in butt-wood ash of trees grown west and east of the Cascades. (2) Few differences between elements were established in butt-wood ash of trees from different parent soils in a given area. (3) Decay by *E. tinctorium* resulted in increased ash content. Conks apparently have an ability to accumulate certain elements selectively, as indicated by higher contents of 11 elements in their ash as contrasted with rotten wood. (4) Different tissues of *A. grandis* showed very variable composition; needles generally showed the highest amounts [of ash elements], followed in order by bark, fungus conks, rotten wood, and sound wood. Specialized tissues such as seed and seed scales showed an anomalous quantity of certain elements.

4571. KRATZL, K., and BILLEK, G. **Zur Biogenese des Lignins. Synthese und Prüfung von**

Ligninvorstufen. [Biogenesis of lignin. Synthesis and testing of lignin precursors.] *Holzforschung, Berlin* 10 (6), 1957 (161-78). 62 refs. [G.g.e.] P.R.

A review under the following headings: the notion of lignin; polymerization of coniferyl alcohol; other aromatic precursors; biogenesis of aromatic substances; synthesis of labelled glucosides of the cambial sap; coniferin transformations in lignified tissues; microethanolysis; labelled Hibbert structural units.

4572. **Morphological aspects of lignification.** *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (86).

A study has been made of lignification in the differentiating xylem of *Pinus radiata* and various species of *Eucalyptus* at different times during the growth cycle. In both cases lignification began at the cell corners and spread along the intercellular layer towards the more mature tissue. Observations such as these are consistent with the idea of a centripetally diffusing precursor. In primary wood, however, a different condition exists; in the protoxylem the middle lamella zone remains unlignified even after formation of secondary xylem begins, which does not agree well with the concept of a diffusing extra-cellular precursor.

Following a suggestion that lignin may originate by oxidation of the phenol-propane type of precursor in the presence of H_2O_2 and peroxidase, the distribution of peroxidase in various specimens of Pine and Eucalypt has been studied. In general it was observed that in the xylem the peroxidase activity was higher in regions of low lignification. Most striking, however, was the intense peroxidase activity in tension wood even in zones far removed from the cambium. Attempts to produce lignification in these areas by culturing in the presence of suitable precursors have not so far been successful. A study is being made of lignification in *Phormium tenax*, a plant which because of its method of growth produces excellent material for examination. Here, too, the process of lignification was complementary to the distribution of peroxidase. [Cf. *F.A.* 18 No. 2076.]

4573. HIGUCHI, T. *et al.* [On the formation of lignin in Bamboo shoots V. Inhibitory effect of ascorbic-acid-glutathione system on the oxidative condensation of coniferyl alcohol by peroxidase.] *J. Jap. For. Soc.* 37 (11), 1955 (502-7). 11 refs. [Jap.jap.e.e.]

Analyses of successive parts of Bamboo shoots (*Phyllostachys* spp.) and chemical experiments suggest that lignin is formed from coniferyl alcohol if it occurs together with peroxidase and H_2O_2 in the absence of a reducing system such as ascorbic acid—glutathione, even if catalase is present in the tissues. [Cf. *F.A.* 16 No. 2199.]

4574. BJÖRKMÄN, A., and PERSSON, B. **Studies on finely divided wood. Part 2. The properties of lignins extracted with neutral solvents from softwoods and hardwoods.** *Svensk PappTidn.* 60 (5), 1957 (158-69). 43 refs. [E.e.sw.g.] P.R.

Contains additional analytical and physical data on milled wood lignin [see *F.A.* 18 No. 2110] from

Picea abies, with some comparative figures for *P. mariana*, *Pinus sylvestris*, *Tsuga heterophylla*, *Thuja plicata*, *Betula verrucosa*, *Populus tremula* and *Fagus sylvatica*.

4575. BJÖRKMÄN, A. **Studies on finely divided wood. Part 3. Extraction of lignin-carbohydrate complexes with neutral solvents.** *Svensk PappTidn.* 60 (7), 1957 (243-51). 29 refs. [E.e.sw.g.] P.R.

Literature on the carbohydrate bond is briefly reviewed. Lignin carbohydrate complexes (l.c.c.), in the form of greyish-white powder, were extracted in high yields by dimethylformamide (DMF), dimethylsulfoxide or aqueous acetic acid from finely divided wood after extraction of milled wood lignin (m.w.l.). The carbohydrate in l.c.c. from *Picea abies*, *Pinus sylvestris*, and *Betula verrucosa* had the composition of hemicellulose. The lignin content varied considerably with different fractions, but the lignin in l.c.c. appeared to be identical with m.w.l. Milling of l.c.c. released m.w.l., while milling of m.w.l. plus a hemicellulose preparation did not yield l.c.c. It is believed that l.c.c. is a mixture of true lignin-carbohydrate compounds and pure carbohydrate. *From author's summary.*

4576. BJÖRKMÄN, A., and PERSSON, B. **Studies on finely divided wood. Part 4. Some reactions of the lignin extracted by neutral solvents from *Picea abies*.** *Svensk PappTidn.* 60 (8), 1957 (285-92). 39 refs. [E.e.sw.g.] P.R.

Compares the elementary composition of milled wood lignin and its derivatives and discusses its behaviour on sulphonation.

4577. PEARL, I. A. **The nature of Aspen lignin.** *For. Prod. J.* 7 (2), 1957 (88-90). 1 ref.

Reports on experiments on (1) spent sulphite, (2) isolated native lignin and (3) completely extracted wood, of *Populus tremuloides* and/or *P. grandidentata*. Ether extraction of (1) gave ca. 2-6% extractives on the basis of liquor solids. The chief component, *p*-hydroxybenzoic acid, was also obtained by direct extraction from *P. tremuloides* wood. Analytical results indicated that the lignin must have a total methoxyl value of < 2%. The significance of *p*-hydroxybenzoic acid to Aspen wood and lignin is discussed in connexion with findings on *P. tremula* [cf. *F.A.* 17 No. 1973].

4578. MCKENZIE, A. W., and HIGGINS, H. G. **The reactivity of cellulose. II. Kinetics of heterogeneous acetylation of Eucalypt α -cellulose in the presence of pyridine.** *Holzforschung, Berlin* 10 (6), 1956 (179-84). 24 refs. [E.e.g.] P.R. [Cf. *F.A.* 18 No. 2113.]

4579. JONES, J. K. N., and PAINTER, T. J. **The hemicelluloses of Loblolly Pine (*Pinus taeda*) wood. Part I. The isolation of five oligosaccharide fragments.** *J. chem. Soc. Feb.* 1957 (669-73). 22 refs. O.R.S. [Cf. *F.A.* 18 No. 2115.]

4580. DUTTON, G. G. S. **A study of the hemicelluloses of Western Hemlock (*Tsuga heterophylla*).** *Abstr. of thesis, in Dissert. Abstr.* 17 (4), 1957 (744). O.R.S. [Cf. *F.A.* 18 No. 927.]

4581. NEUBAUER, L. G., and PURVES, C. B. Structure of a hemicellulose from Maple [*Acer saccharum*] wood previously extracted by liquid ammonia. *Canad. J. Chem.* 35 (4), 1956 (388-96). 32 refs. O.R.S.

4582. ADAMS, G. A. Constitution of a water-soluble hemicellulose from American Beechwood (*Fagus grandifolia*). *Canad. J. Chem.* 35 (6), 1956 (556-64). 18 refs. O.R.S.

4583. BOUVENG, H., and LINDBERG, B. Studies on arabogalactans. I. Products from the mild hydrolysis of the arabogalactan from *Larix occidentalis*. *Acta chem. scand.* 10 (10), 1956 (1515-9). 7 refs. [E.e.] O.R.S.

813.2. Minor Organic Constituents. Extractives. Cell Contents

4584. ERDTMAN, H., HARVEY, W. E., and TOPLISS, J. G. The chemistry of the natural order Cupressales. XVI. Heartwood constituents of *Chamaecyparis nootkatensis* (Lamb.) Spach. The structure of chamic and chaminic acids. *Acta chem. scand.* 10 (9), 1956 (1381-92). 13 refs. [E.e.] O.R.S. [Cf. F.A. 14 No. 1533.]

4585. BREDENBERG, J. B., and GRIPENBERG, J. Constituents of the wood of *Juniperus communis*. *Acta chem. scand.* 10 (10), 1956 (1511-4). 7 refs. [E.e.] O.R.S.

[Cf. F.A. 16 No. 3401.] The neutral part of the extract of the wood of *J. communis* contains, in addition to sugiol, a substance most probably a mixture of ferruginol and some closely related compound, and also a yellow compound termed xanthoperol. Xanthoperol appears to be an artefact and a partial structure is suggested. *From authors' summary.*

4586. BREDENBERG, J. B. The non-occurrence of cedrene and cedrol in *Juniperus communis* L. *Acta chem. scand.* 11 (1), 1957 (98-100). 23 refs. [E.e.] O.R.S.

Data from literature on the occurrence of cedrol and cedrene in *Juniperus* spp. is tabulated. It appears possible to differentiate the sections *Sabina* and *Oxycedrus* by the presence or absence of these constituents. Neither was found in the ethereal oil from the wood of *J. communis* (*Oxycedrus* section).

4587. ERDTMAN, H., PELCHOWICZ, Z., and TOPLISS, J. G. The chemistry of the natural order Cupressales XVII. Heartwood constituents of *Pilgerodendron uviferum* (D. Don) Florin) (= *Libocedrus tetragona* Endl.). *Acta chem. scand.* 10 (10), 1956 (1563-7). 6 refs. [E.e.] O.R.S.

From the alkali-soluble fraction of the heartwood of *P. uviferum* a very small quantity of a highly dextro-rotatory crystalline phenol, probably of the flavanone type, was isolated. The large neutral fraction was shown to contain a mixture of cadinenes and also a new crystalline cadinol, for which the name pilgerol is proposed. *From authors' summary.*

4588. HASEGAWA, M., and SHIRATO, T. Flavonoids of various *Prunus* species. V. The flavonoids in the wood of *Prunus verecunda*. *J. Amer. chem. Soc.* 79 (2), 1957 (450-2). 7 refs. O.R.S.

4589. HASEGAWA, M. Flavonoids of various *Prunus* species, VII. The flavonoids in the wood of *Prunus ssiiori* and *Prunus spinulosa*. *J. Jap. For. Soc.* 38 (3), 1956 (107-8). 7 refs. [E.e.jap.]

4590. SANDERMANN, W., and DIETRICH, H. H. 'Begleitstoffe'—Ursache der Eigenart der Hölzer. Ergebnisse papierchromatographischer Untersuchungen. [Extraneous materials: the cause of wood peculiarities. Results of paper chromatographic analyses.] *Umschau, Frankfurt am Main* 57 (7), 1957 (197-200). 7 refs. [G.]

The investigation aimed chiefly at the isolation of active substances from the extractives of termite-resistant woods. A technique is described, using cardboard instead of paper, which permits the isolation by elution of quantities sufficient for termite testing and further analysis. Three *Diospyros* species and 4 Bignoniaceae were analysed. The active substance in *Paratecoma peroba*, *Tabebuia flavescens* and *T. ipé* was identified as lapachorone. In *T. ipé*, the content of this substance was greatest in the sap/heartwood border zone, while the content of tectoquinone in Teak (its termite-resistant substance) was greatest in the central heartwood. Tectoquinone content of Teak from various regions corresponded well with the known termite-resistance ratings. Substances inhibiting the drying of lacquers were also investigated [cf. F.A. 18 No. 3339].

813.3. Ash Constituents

See Nos. 3686, 4570.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 4590, 4664, 4685-6, 4705-7, 4710-1, 4716.

4591. JACKSON, W. F. The durability of Malayan timbers. *Malay. Forester* 20 (1), 1957 (38-48 + 1 tbl.). 9 refs. Also as Trade Leaflet. *Malay. For. Serv.* No. 28. Price 50 cents (1s. 3d.).

Specimens from 84 timber species, mostly Malayan, have been tested for durability by partial burial in outdoor testing grounds. Many of the tests were on timbers tested by Foxworthy between 1918 and 1930; the more recent tests generally used a larger number of specimens, from logs obtained for tests on mechanical and physical properties. The specimens used were of 2-in.-square cross-section, and were placed in rows with each stick touching those on either side, instead of being spaced well apart as in most tests elsewhere. The average life for each species tested is tabulated, and in another table the species are grouped under trade names wherever possible, and placed in four durability classes. For some timbers not included in the main series of tests, the information given has been derived from published results of earlier tests. *From author's summary.*

4592. KOHARA, J., and OKAMOTO, H. *Studies of Japanese old timbers. Scientific Reports of the Saikyo University (Agriculture), Kyoto No. 7, 1955 (9-20). 16 refs. [E.e.]*

Sound specimens of *Chamaecyparis obtusa* (300-1300 years old) and of *Zelkova serrata* (240-650 years old) from old buildings were tested against samples of new wood. Shrinkage and hygroscopicity decreased with increasing age. Bending and compression strength and hardness also decreased, but for *C. obtusa* the decrease was preceded by an increase up to the age of 80 years. Chemical changes in the wood were found to be greater in *Z. serrata* than in *C. obtusa*. The content of cellulosic materials decreased with age, faster in *Z. serrata*, and their chemical inertness (as shown from their crystalline-cellulose content and their viscosity) increased early in ageing and then decreased. Close resemblances were found between the effects of heat treatment and of ageing. [Cf. *F.A.* 16 Nos. 4540-1.]

4593. KOHARA, J., and OKAMOTO, H. [Studies on the permanence of wood (XIV). The influence of age on the viscosity of cellulose in old timbers.] *J. Jap. For. Soc.* 37 (11), 1955 (499-501). 3 refs. [Jap.e.e.]

The viscosity of Wise holo- and α -cellulose, and Cross-Bevan α -cellulose from old Hinoki timber (*Chamaecyparis obtusa*) first increased, then decreased with age. This trend was analogous to the changes found in mechanical strength and in crystallized-cellulose content. The oldest timbers tested were 1400 years old. *From authors' summary.*

4594. KOHARA, J. et al. [Studies of Japanese old timbers. (XXII). Decay durability test of old wood against several species of wood-rotting fungi.] *J. Jap. For. Soc.* 38 (6), 1956 (230-3). 2 refs. [Jap.jap.e.e.]

Tabulated results of tests using 2 samples of new and 9 of old wood, 350-1300 years old, all *Chamaecyparis obtusa*, exposed to 3 fungi, 2 attacking lignin and one cellulose, show that resistance to decay of old wood varies with the fungus species.

4595. SAKATA, K., and KISHIMOTO, S. [The physical and chemical properties of soaked Hinoki-wood (*Chamaecyparis obtusa* Sieb. et Zucc.).] *Transactions of the Tottori Society of Agricultural Science, Tottori* 10 (4), 1955 (34-8). 10 refs. [Jap.e.] C.G.B.

Strength and durability of a piece of Hinoki wood which had been buried for 8 years in the bottom of a river was found to be no different from that of ordinary Hinoki wood. [Cf. *F.A.* 18 No. 4153.] *From authors' summary.*

815. Effect of Growth Factors on Structure and Properties

See Nos. 3764, 4172, 4526, 4530, 4532-4, 4549-50, 4553.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

4596. Messeheft 1957: Technik und Holzwirtschaft. [Fair number 1957: Technology and wood industry.] *Holz-Zbl.* 83 (49/50), 1957. pp. 152. [G.]

A special number devoted to the Hanover Industries Fair, with illustrated descriptions of German woodworking machines, presses, driers, chippers etc., and also of the Stihl BLK one-man power saw with attachments, the latter including a pumping unit capable of a lift of 7 m., a spraying reach of 30 cm., and a capacity of 200 litres/min. for use in irrigating, spraying, or fire-fighting, and a special thinning tool with an attachment gripping the tree at its base, allowing the operator to work in an upright position when felling trees up to 30 cm. in diameter and leaving his left hand free to control the tree's fall. Special articles discuss: Surface problems in veneer peeling and slicing (*H. Doffiné*). Better sawn surfaces (*H. M. Maisenbacher*). Improving surfaces through planing and finishing (*K. Tschernjakow*). Making use of efficient gluing techniques in the design of mass-produced furniture (*C. Schmidt-Hellerau*). Water-cooled paint-spraying cabinets (*H. Schröter*).

4597. [Machines on show at Hanover.] *Int. Holzmarkt* 1956 (8; 11), (11-35; 10-20). [G.]

Describes briefly some of the woodworking machinery shown by some 100 firms, mainly German and Austrian, at the Hanover fair 1956.

4598. Das Angebot von Hannover 1957. [Exhibits at Hanover, 1957.] *Int. Holzmarkt* 1957 (8), (7-43). [G.]

Lists 118 firms, mainly German, exhibiting woodworking equipment at the fair, with notes on their exhibits.

4599. [The German Industries Fair, Hanover, 1957.] *Holztechnik* 37 (4), 1957 (123-43). [G.] P.R.

Contains a foreword by H. Kraus, a plan and useful information, and an alphabetical list of firms (95 in all) with brief descriptions of their exhibits.

821. Barking

See Nos. 4121, 4771.

4600. FOBES, E. W. Developments in debarking. *Tappi* 40 (3), 1957 (178A-180A). P.R.

To facilitate comparison of different types of barking machines, tables and graphs are included showing the relationship of cords of pulpwood (per hour) to linear feet (per minute). This is followed by a general description of barking machines, including those used in sawmills, for use in pulpmills.

4601. FOBES, E. W. Bark-peeling machines and methods. *Rep. U.S. For. Prod. Lab., Madison* No. 1730 (rev.) 1957. pp. 48. 48 refs. P.R. [Cf. *F.A.* 11 No. 379.]

4602. VOSPERNIG, R. Wie arbeitet eine Nass-Entrindungsanlage? [The working of a wet-barking installation.] *Holz-Kurier, Wien* 12 (14), 1957 (6). [G.]

Describes a modern installation in a paper mill in Styria. The pulpwood, in lengths of 1.4 m., is fed wet, after steaming at 96-98° C., into a large drum having interior iron ribs and with its lower part in water, in which it is tumbled at 4-9 rev./min. for

automatically adjustable periods. Any remnants of bark remaining are removed by hand on the conveyor leading to the chipper. Wood losses in barking (excluding bark) are only 0.8–1%.

4603. HANDEL-MAZZETTI, P. Das Nassschälverfahren in der Papierindustrie. [The wet barking process in the paper industry.] *Int. Holzmarkt* 1957 (5), (41–4). [G.]

Describes the procedure at a mill using the Karlström process, in which the wood is steamed at 95° C. before drum-barking by friction, giving particulars of equipment, length of steaming (3–12 hours, varying with species, diameter, length of storage, season), steam consumption, speed of barking, crew size, loss of wood etc. Makes recommendations for smaller mills.

822. Saws and Sawing

See also Nos. 4103, 4155, 4596.

4604. HAYASHI, D., and SUZUKI, R. [An experiment on wood-sawing with a hand saw.] *J. Jap. Wood Res. Soc.* 2 (5), 1956 (177–8). 2 refs. [Jap.e.e.]

Results of tests with a special apparatus (illustrated) seem to indicate an optimum slant angle [between the line of the tooth points and the surface of the wood] of 45–60° for cross-cutting, and ca. 15° for rip-sawing.

4605. ANDREWS, G. W. Adjustable sawmilling gauge. Forest Products Laboratories of Canada, Ottawa. 1957. pp. 3. P.R.

[Cf. F.A. 16 No. 2218.] Illustrated description of a spring-loaded gauge for measuring the thickness of lumber, capable of exerting a force of 50 lb./in. of travel, before and during the cut. The use of the gauge increases the uniformity of the sawn board throughout its length and width, by reducing backlash between the racks and pinions and enabling the lumber thickness to be set accurately at the head-rig.

4606. LALOYLAUX, L. Le travail de la scie circulaire: application au sciage du diambi (*Guarea cedrata*). [The work of the circular saw. Application in sawing *G. cedrata*.] *Publ. Inst. nat. Étude agron. Congo belge (Sér. tech.)* No. 50, 1956. pp. 46 + 8 photos. Price Fr.40.

In part I, equations of the cycloid path of a tooth tip through the log are presented and the factors affecting bite and thickness of the chip considered. Work absorbed at the tooth is a function of the volume of the chip. Part II covers a demonstration of the effect of bite size on the blunting of circular-saw teeth in the conversion of *Guarea cedrata* (considered an abrasive timber), the following methods being used: (a) photomicrographs of teeth before and after sawing, (b) wattmeter recordings comparing the work done in sawing an amenable timber (*Terminalia superba*) with that required by the refractory timber, (c) direct wattmeter recordings of the increasing amount of power required as the blunting increases along the saw-cut. Methods (b) and (c) are dealt with in detail for bites of 50, 100, and 400 μ with feed speeds of 3, 6, and 24 m./min. respectively (saw dimensions given).

Hard and abrasive timbers should have the feed-speed/saw-speed ratio as high as the power at disposal permits, so that the bite is as large as the desired standard of surface smoothness allows, remembering that a minimum of 1000 rev./min. is required to hold the saw on the cut.

4607. GANESAN, K. A note on the performance of the 'Forestière C.D.4' band saw mill. *Ceylon For. (n.s.)* 2 (4), 1956 (226–7).

Notes on the use of this bandsaw, installed in 1953 at the Forest Department Research Laboratory, in sawing *Artocarpus integra*, *Chloroxylon swietenia*, *Mangifera zeylanica*, *Palaquium petiolare*, *Trema orientalis*, *Ochroma lagopus*, and *Antiaris toxicaria*. More than 12,500 cu. ft. of logs have been cut, performance has been uniformly good, and the machine has needed little attention beyond routine maintenance.

4608. SUGIHARA, H., and SUMIYA, K. [Power requirements for idle running and starting of a band-saw machine.] *J. Jap. Wood Res. Soc.* 2 (3), 1956 (99–103). [Jap.e.e.] P.R.

Calculates power requirements for a 42-in. table bandsaw; results of calculations agree with those obtained experimentally.

4609. [Rapid Automat Sawbench.] *Sth. Lumber.* 194 (2427), 1957 (32).

A brief description of a Swiss rip-saw in which the work is held stationary while the saw travels along the bench. It will take logs up to 19 ft. long and has an adjustable fence that makes accurate setting possible by direct reading of a visual scale.

4610. BURNET, D. Measuring headrig precision through the use of quality control charts. *For. Prod. J.* 7 (5), 1957 (33A–36A).

Describes techniques used in 5 mills to record thickness variations in boards. Control limits of range (differences between daily extremes) and average (expressed as deviation from desired size) were calculated from 5 measurements on each of 5 randomly selected boards per day over 20 days. If a daily mean fell outside the control limit of range, or 7 consecutive daily means fell on one side of the average, reasons had to be looked for. Accuracy was greatly improved by control.

823. Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See No. 4596.

4611. HOYLE, R. J., JR. Boring tests of particle board. *For. Prod. J.* 7 (5), 1957 (159–62). 2 refs.

Reports on strength tests of dowel joints in holes bored at speeds of 1620–4430 rev./min. and feed rates producing chips $\frac{1}{128}$ to $\frac{1}{16}$ in. thick, in particle boards, (a) extruded, hardwood and softwood particles aligned $\perp$ to surface, (b) flat-pressed, softwood particles $\parallel$ to surface. A speed of 2880 rev./min. and a boring-chip thickness of $\frac{1}{32}$ in. proved best, but rates giving chips of $\frac{1}{16}$ in. were also satisfactory, while those giving $\frac{1}{128}$ -in. chips resulted

in very weak joints, particularly in (b), a result attributed to the effect of heating [cf. *F.A.* 18 No. 2140]. Strength was greatest where the dowel axis was || to the alignment of the particles. On boards of the same structure, higher density increased dowel strength; so also did veneer surfacing, and joints in veneered boards were comparable in strength to those in solid *Liriodendron tulipifera*.

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

4612. MEYER, A. On the bearing capacity of nailed connections under static loads. *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3342, 1956. pp. 2. Transl. by J. D. Boyd and J. H. Kahsnitz from *Holz-Zbl.* 80 (117), 1954 (1371). Limited distribution.

Discusses experiments at Brunswick on the permissible loads for nails.

824.4. Dowelled Joints

See No. 4611.

824.5. Timber Connectors

4613. STÖY, W., and LÖHR, H. The effects of using small diameter bolts and sheer plates on bearing capacity of 'GEKA' timber connectors. *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3341, 1956. pp. 5 + 2 photos, 2 gphs., 1 tbl. Transl. by J. D. Boyd and J. H. Kahsnitz from *Holz Roh- u. Werkstoff* 12 (2), 1954 (64-7). [See *F.A.* 16 No. 2227.] Limited distribution.

824.8. Glues and Gluing

See also Nos. 4100, 4512, 4596, 4639, 4644, 4726.

4614. MARRA, A. A. [Editor] **Developments in glues and gluing.** *For. Prod. J.* 7 (2), 1957 (40-4).

A review, for 1956, of N. American developments in the fields of: Adhesives (R. F. Blomquist); Techniques (C. F. MacLagan); Equipment (R. Williams); Test methods (J. Butler) and Current Research (J. S. Bethel), the last named listing 54 projects.

4615. BAKER, A. **The tropical durability of wood assembly adhesives (Final note).** *Technical Note, Royal Aircraft Establishment, Farnborough* No. Chem. 1294, 1957. pp. 17 + 6 photos, + 2 dgms. + 2 tbls. P.R.

In a five-year tropical trial of 6 proprietary wood-assembly adhesives by the 'boxed test-piece' technique [cf. *F.A.* 16 No. 4570], joints made from one of two urea resins showed significant loss of strength, but the other urea adhesive showed good resistance to deterioration in both close contact and gap joints. Two phenolic and two resorcinol resins were also substantially unaffected by the tropical exposure, except that one of the phenolic resins showed poor retention of the gap-filling property; with this exception, all the materials behaved satisfactorily in the temperate indoor storage of joints over the same period. *Author's summary.*

4616. TSCHIRCH, E., and LIESE, H. Tierische Leime für neuzeitliche Verarbeitungsmethoden.

[**Animal glues for modern processing methods.**] *Holz Roh- u. Werkstoff* 14 (3), 1956 (101-4). 6 refs. [G.g.] P.R.

In respect of strength, resistance to heat and continuous stress, hot-pressing animal glues are at least as suitable for gluing wood as synthetic-resin glues; they are now being used even for H.F. gluing. Results of some comparative tests are shown in tables and a graph.

4617. TAKASHIMA, T., KAYAMORI, H., and MOTEKI, S. [Researches on blood glue (VIII). On blood-clot glue (1.)] *J. Jap. For. Soc.* 38 (7), 1956 (273-5). 3 refs. [Jap.jap.e.e.]

[Cf. *F.A.* 16 No. 2235.] Glue strength of hot-press plywood increased with pressure and temperature during gluing, but was not much affected by pressing time.

4618. RAUCH, A. H. **Glue spreading by spraying method.** *For. Prod. J.* 7 (3), 1957 (105-9).

Describes experiments, using exterior phenol-formaldehyde resins with a furafil-extender, on rotary-cut Douglas Fir veneer of < 5% m.c., aimed at reducing glue losses and uneven spread due to thickness variations in veneers. Best results were obtained with a diagonal row of stationary spray guns spaced 3 in. laterally and ca. 6 in. along a line diagonal to a conveyor moving the veneer at ca. 80 linear ft./min., at a height of ca. 18 in. above the spraying surface; each gun produces a 12-in fan that overlaps by 9 in. that of adjacent guns, so that each part of the veneer receives glue from 4 guns. A pumping system regulates glue pressure. A glue viscosity of 1000 cps., a pumping rate of 225 c.c./min., a fluid nozzle orifice of 0.086 in. diam. and an air pressure of 15 lb./sq. in. producing a spread of 30 lb./1000 sq. ft. was found to be best. Uniformity of spread and bond quality compared well with roller methods, and it was possible to obtain good bonds with veneers 0.010 to 0.025 in. below average thickness. Further potential advantages are discussed.

4619. HORIOKA, K. [Research for the improvement of wood: (Rep. No. 4.) Study on the forming of adhesive layer (glue-line). (Rep. No. 5) Study on the measuring method of adhesion quality (Part 1). (Rep. No. 6) Study on the properties of wood with special reference to its adhesion.] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 89, 1956 (57-150). 28 refs. [Jap.jap.e.e.]

[Cf. *F.A.* 18 No. 3373.] (4) Presents the mathematical theory and experimental proof of the relations between rate of spreading, viscosity and compression of glues, with a detached investigation into change of viscosity and wood surface impregnation so as to determine the thickness of glue-line. Appropriate equations are developed. (5) To ensure for the purpose of study that (c) the cohesion of the glue line [see Report 3] was the weakest link, sheets of juralmin [? Duralumin] and polyvinyl butylal were substituted for wood and adhesive respectively and the relation between loading velocity, area of adhesion and adhesion strength determined experimentally. Tables are derived for adhesion strengths

under various tests, glues, etc. e.g. for high water-proof ply, multi-ply, and for the relation of this strength to core thickness, for the last of which a series of regressions are given. A new relation is found between the tensile strength of the bond and the angle of the scarf joint, of probable use in laminated wood manufacture. Basic data are also given on the strength of laminated arches. (6) The adhesion of wood is studied in relation to heart- and sapwood, width of annual ring and % of summer wood in *Cryptomeria japonica*; specific gravity (37 species, including 34 important in Japan) with various glues; angle of adhesion surface and annual rings; roughness of surface; moisture content of test piece at time of manufacture and at the time of test; angle of grain and adhesion surface; defects (knots, compression wood, 'ring gall' and collapse). Comprehensive tables are included, one of which groups the 37 species according to their adhesion quality.

4620. CONNELLY, H. H. **Cut production costs with new techniques of hot plate gluing.** *Veneers & Plyw.* 50 (12), 1956 (15, 38-40). P.R.

Describes the features of new presses (thicker aluminium plates, sometimes up to 0.125 in., with rifle-drilled steam ducts; and reduction of handling by the use of mechanical lifts, conveyors and loaders).

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See Nos. 4596, 4636-7.

829.1. Finishing

See also Nos. 4512, 4596, 4641-3.

4621. THOMAS, F. H. **Finishing developments in 1956.** *For. Prod. J.* 7 (2), 1957 (52-3). 4 refs.

Covers paints, natural exterior and interior finishes, furniture colours, etc., and mentions current research projects, including the use of ultra-violet absorbers to prevent colour changes of wood exposed to sunlight.

4622. BROWNE, F. L. **Swelling of paint films in water. VI. Effects of different oil on oleoresinous vehicles. VII. Latex vehicles. VIII. Swelling of linseed oil paints in water and organic liquids. IX. Effects of temperature during soaking and film formation, and repeated soaking and drying. X. Rate of penetration of water, permeability to water vapour, and penetrability to air in relation to water absorption.** *For. Prod. J.* 6 (4; 6; 8; 10), 1956 (152-9; 235-40; 312-8; 453-8); 7 (4), 1957 (145-54). 70 refs. [Cf. *F.A.* 16 No. 4582.]

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

4623. **Unpopular species and their increased use [in Canada].** *For. Chron.* 33 (1), 1957 (7-30).

Papers read at a symposium: Unpopular species and their increased utilization (*R. S. Wellwood*); ditto (*G. D. Morrison*) [deals with pulping experiments]; ditto in the Maritimes (*H. D. Heaney*); Lodgepole Pine and its increased utilization (*D. I. Crossley*).

831. Fuelwood and Various Types of Rough Timber

See also Nos. 4675, 4677-80, 4683-6, 4695.

4624. CHAMBARD, H. **Le marché des bois de mine pour les charbonnages.** [The market for mining timber for the coal mines.] *Rev. for. franç.* 9 (5), 1957 (351-69). [F.]

Gives data on supply, demand, prices and costs for mining timbers in France, other industrial uses of comparable material (transmission poles, pulpwood etc.), and possible market in neighbouring countries.

4625. KEENEY, W. D., MANN, R. H., and BURPEE, C. M. **Pressure treated timber foundation piles.** American Wood Preservers' Institute, Chicago. 1955. pp. 66. P.R.

A report based on documented case histories, prepared by the engineering staff of the American Wood Preservers' Institute, including: (a) a number of pile-driving formulae for calculating the proper relation between bearing loads, weight of hammer and weight of pile; (b) means for determining the safe load capacity for each pile and group of piles; (c) methods of solving problems raised by uplift and lateral forces; (d) devices to protect pile heads during driving; (e) excerpts from the principal basic building codes; (f) specifications of the American Society for Testing Materials for selecting timber piles; (g) standards of the American Wood Preserving Association for preservative treatment; and (h) test pile driving and test loading. A table at the end gives details of important structures in the U.S.A. founded on creosoted timber piles.

832. Mills, Their Functions and Products

See also No. 4103.

832.1. Sawmills and Planing Mills

See also Nos. 4106, 4605 *et seq.*, 4698.

4626. **Job training program improves work performance.** *Lumberm.* 84 (5), 1957 (42, 73).

Selected applicants are given a 3½-hour test in intelligence, verbal, numerical, spatial and form perception, clerical ability, motor coordination, and finger and manual dexterity. Successful candidates pass to the Boise Payette Lumber Co., Boise, Idaho, for training by the company and State vocational education department. These two bodies, the county education authority and the trade union, review each of the annual courses. Candidates are then drafted, some to a 30-40 hour initial class training; others straight to the job. Courses cover every job in the mill, from sawing to blue-print reading.

4627. TURNBULL, R. F. **Sawmilling, machining, peeling, grading, and utilization of residues [of Eucalypts].** *Final Rep. World Eucalyptus Conf., Rome 1956*, 1956 (163-9). [E.]

Techniques and equipment required in extraction, conversion and veneer cutting; grading for bending; grading of sawn timber, building timber etc., uses of wastes for fuel, pulping, compost etc.

4628. FERGUS, A. W. **Log handling with rivetless chain.** *Pulp Paper Mag. Can.* 58 (3), 1957 (176-8, 181).

Gives details of the X-588 chain developed specifically for log-handling, shows the lay-out of conveyors at mills using it, and gives data on speed, friction, capacity, etc.

4629. **Sawmilling and engineering. Electronic log-sorting.** *Timb. Tr. J.* 219 (4189), 1956 (70-1).

Supplements a previous article [see *F.A.* 18 No. 513]. The logs are drawn up from the water to a barker and thence to a detector that will reject logs with metal inclusions. They then pass up the conveyor where a photo-electric cell counts them, determines their mid-points and lengths, and records these details by punching holes in a paper strip, synchronized to travel (ca. 1 yard/min.) with the conveyor belt. An operator calipers each log as it passes and, by pressing a button, assigns it to one of 17 diameter classes. When the mid-point of a log arrives opposite its appropriate bay another photo-electric cell, triggered by a punched hole in the strip, actuates machinery causing the log to fall with its centre point close to those of its fellows, which makes for ease of bundling or grabbing. A counter-mandling button can be used in cases of error.

4630. THUNELL, B. Om sågningseffekt och avbrott. [Sawing efficiency and interruptions.] *Pap. ja Puu* 39 (3), 1957 (79-85). 3 refs. [Sw.e.] P.R.

Discusses the effect of non-productive time (not necessarily recorded if of very short duration) on the results of time studies in sawmills.

4631. **Push-button sawmill plant.** *Sth. Lumberm.* 194 (2428), 1957 (60...65).

An illustrated description of automation in a Texas mill, including e.g. an unattended barker for tree-length Pine logs, and a closed-circuit television system enabling one man to control the movement of 42 kiln loads.

4632. SIIMES, F. E. Tukkien lenkouden vaikutus sahaustulokseen. [The influence of crookedness of logs on sawing yield.] *Pap. ja Puu* 39 (3), 1957 (93-8). [Fie.] P.R.

A number of straight and crooked logs were sawn separately and the sawn stock was measured and graded. With increasing crookedness both consumption of raw material, and the number of short boards and battens increased. Comparative prices are tabulated. It is concluded that very crooked logs should not be sawn but used in some other way. *From author's summary.*

4633. MATSON, E. E. **White Fir lumber recovery at a western Washington sawmill.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 141, 1957. pp. 8.

Data on the volume and lumber grade recovery for log grades 2 and 3 are given, based on a study of 166 logs of *Abies amabilis* and *A. grandis* of diam. classes between 14 and 30 in.

4634. MATSON, E. E. **Western Hemlock lumber recovery at a western Washington sawmill.** *Res.*

Note Pacif. Nthwest. For. Range Exp. Sta. No. 140, 1957. pp. 9.

Data are given on volume and lumber grade recovery for log grades 2 and 3, based on a study of 209 logs with diameters ranging between 9 and 39 in.

4635. **New Stenner portable sawmill.** *Timb. Tr. J.* 221 (4204), 1957 (94-6).

This model, destined for Canadian operation, is designed for logs up to 30 in. diam. and 18 ft. long. It consists of a vertical bandsaw (48-in. pulley, 6-in. saw, working at > 9000 ft./min., with a quick-change pulley to give slower speed for frozen or harder timber); a log carriage with hydraulic feed up to 525 ft./min. and equipped with air dogging, log flippers and electric set-works; a 3-saw edger; live and dead rolls; and a 24-in. trim saw, which is set on the ground. In remote control of most operations are a sawyer and edgerman who, together with the trimmer, constitute the crew. Power is supplied by oil engines (130-h.p. Rolls-Royce and 46-h.p. Ford). The 16-ton trailer, mounted on twin pneumatic tyres, is 48 ft. long and the whole set-up 85 ft. long. The makers are Stenners of Tiverton Ltd. England.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 3886, 4100, 4596, 4614 *et seq.*, 4627, 4656-7, 4698.

4636. FEIHL, A. O. **Cutting White Spruce veneers for plywood.** *Repr. from Canadian Woodworker* [Toronto] Nov., 1956. pp. 4.

Studies of rotary cutting, involving 8 variables, were made, and optimum lathe settings for cutting $\frac{1}{16}$ -, $\frac{1}{10}$ -, $\frac{1}{8}$ - and $\frac{1}{4}$ -in. veneers are given. To increase resistance of the knife tip to damage from knots, the 'microhoning' method developed in Finland [see *F.A.* 16 No. 995] was successfully used, and is described. Veneer yields were 64% of the total volume of the bolts. Shrinkage of sheets dried from 75.2% m.c. to 7.3% was: radial direction 2.1%; tangential 6.2%; longitudinal, normal wood 0.09%, compression wood 0.5%. Defects, in order of importance, were: knots, splits, compression wood, spiral grain, and resin pockets. From the plywood panels made experimentally, it seems that White Spruce plywood of appropriate bond type and thickness could be used for construction and shipping containers, and, because of the decorative value of the intergrown knots, perhaps for panelling.

4637. SERGEENKO, G. A. **Mechanical feeding of logs to the veneer lathe.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3317, 1956. pp. 2 + 2 dgms. Transl. by M. Slade from *Derev. lesohim. Prom.* 3 (2), 1954 (29). Limited distribution. P.R.

Illustrated description of the design and operation of a device for feeding the peeler log mechanically to the charging and centering mechanism; also a device for ejecting cores from the veneer lathe.

4638. TUTUMOTO, T. [Studies on the cause and control of end waviness and splitting during veneer drying.] *J. Jap. Wood Res. Soc.* 2 (2), 1956 (88-91). 6 refs. [Jap.e.e.] P.R.

The following pre-treatments are suggested by the author for preventing these defects, believed to be caused by the end portion of the veneer drying relatively faster: (1) pasting a kraft-paper tape 30 mm. wide on one side of the end portion; (2) wrapping the end portion in polyethylene-coated kraft paper 15 mm. wide, and (3) cutting and patching up the end portion at 50-mm. intervals.

4639. PERRY, T. D. **Moisture content in gluing plywood.** *Veneers & Plyw.* 50 (6), 1956 (14, 32-6). P.R.

Tables showing the surplus m.c. to be re-dried from plywood (Poplar, Birch, Douglas Fir, 5-, and 7-ply and 5-ply with lumber core) after gluing by 6 different glues (2 vegetable, casein and urea at room temperature, and urea and phenolic in hot press). The surplus m.c. introduced by the glue solvents ranges from 14½% to 2% above the normal m.c. of 5%. The technique of re-drying is described.

4640. **Equalizing moisture content in plywood.** *Veneers & Plyw.* 50 (7), 1956 (17, 35). P.R.

The total moisture content of plywood (including the moisture from the glue solvent) must be gradually reduced to the desired level and uniformity. This equalization requires air-conditioned compartments in which plywood should remain for 15-30 days.

4641. DUNNE, J. J. **Flexible paper- and fabric-backed veneers.** *For. Prod. J.* 7 (5), 1957 (31A-33A).

Traces development, manufacturing processes, requirements of flitches, uses, installation etc. of these $\frac{1}{8}$ -in. veneers.

4642. RITCHIE, J. D. **Special products take hold in the veneer and plywood industry.** *For. Prod. J.* 7 (2), 1957 (37-40). 7 refs.

Special products discussed in this annual review for 1956 include panels using the Beautyguard process, decorated surfaces, overlaid plywoods and their uses, Plyron (hardboard-faced plywood) and pre-shaped or pre-machined articles.

4643. **Beautyguard—the hardwoods industry's answer to plastics.** *Veneers & Plyw.* 50 (12), 1956 (12-3, 24...28). P.R.

Discusses the merits of Beautyguard surfaces obtained by bonding an aluminium foil beneath the face veneer in standard furniture plywood construction, the tops being finished with a finish resistant to a cigarette's heat, alcohol, nail polish, fruit juices etc.

4644. COUFAL, J. W. **Gluing and fabricating flush doors.** *For. Prod. J.* 7 (3), 1957 (26A-29A).

Discusses various core materials—insulation board, paper honeycomb, double-faced corrugated kraft board and face materials (including hardboard), adhesives, and processes.

4645. RHODE, M. J. **Quality control in the production of laminated timbers.** *For. Prod. J.* 7 (3), 1957 (100-5). 8 refs.

Discusses and describes the place and function of the quality-control department, including, in addition to the surveillance and testing of raw materials and finished products, assistance in the establishment

of proper production procedures and specifications and acting as a liaison between production and design. All phases of manufacture are covered. *From author's summary.*

4646. FUKUI, H. [Studies on laminated woods with sawn boards. IV. The strength of glued end joints within laminations in laminated columns made from *Cryptomeria japonica*.] *J. Jap. Wood Res. Soc.* 2 (3), 1956 (108-13). 6 refs. [Jap.e.e.] P.R.

Presents results of comparative tests between (1) laminated columns with scarf end-joints in the laminations, and, as controls, (2) columns with continuous laminations, and (3) columns of solid wood. The load-deflection curves obtained and the values of buckling (maximum) loads and buckling stresses show the bending and shear strength of (1) to be not inferior to that of (2) or (3).

832.2. Match Factories

4647. DOUAY, J. Bois d'allumettes: à la recherche d'essences nouvelles. [Matchwood: the search for new species.] *Bois For. Trop.* No. 52, 1957 (45-8). [F.]

Experiments with African-grown *Gmelina arborea* (described in detail) showed that it is at least as suitable for use in match manufacture as *Bombax malabaricum*, which is generally used for the purpose in India.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

4648. **Timber design and construction handbook, prepared by Timber Engineering Company.** F. W. Dodge Corporation, New York. 1956. pp. [5] + 622. Price \$12.75 (£5. 2s.).

Contains sections on: wood properties; commercial lumber standards; preliminary design considerations (duration of load, species, grades and sizes, seasoning and use conditions, preservatives, fastenings); post and beam construction; roof trusses; arches; special framing; exterior structures; plywood; fabrication, assembly, erection and maintenance; specification forms; reference data (tables and graphs of properties, allowable unit stresses, maximum spans etc.); and design standards—the most generally accepted U.S. standards for timber design and construction current at time of printing. There is a glossary and list of abbreviations, and many illustrations, graphs and tables.

833.1. Building Components and Fittings: General

See also Nos. 4644, 4741.

4649. TURNBULL, R. F. **Timber specifications for dwellings.** *Aust. Timb. J.* 23 (1), 1957 (85...95). 5 refs.

Data published by the C.S.I.R.O. forest products and building research divisions and the Standards Association of Australia are drawn upon to guide architects in respect of: class of construction; live loads; species and grade of timber; spacing of members; sizes recommended.

4650. BOYD, J. S. Secondary stresses in trusses with rigid joints, special application to glued wooden trusses. *Abstr. of thesis, in Iowa St. Coll. J. Sci.* 30 (3), 1956 (328–30). O.R.E.

Includes a discussion of experimental method. The S.R.-4 electric strain-gauge was found suitable for the measuring of strain in wood, and the use of hydraulic cylinders a practical and accurate method of loading.

4651. SALLENAVE, P. Les bois tropicaux en menuiserie de bâtiment. [The use of tropical timbers for joinery in buildings.] *Bois For. Trop.* No. 53, 1957 (39–46). [F.]

Notes on the increasing use in France of tropical timbers for doors, floors, window frames etc.

4652. Holzfußböden—Grundlagen, Rohstoff, Bearbeitung und Verlegung. [Wooden flooring—general information, raw material, conversion and laying.] *Repr. from Baugewerbe, Berlin* Nos. 3 & 4, 1957. pp. 15. [G.] P.R.

Discusses and tabulates the heat-insulating and sound-proofing properties of wooden floorings of different types, and gives instructions for the proper laying of floorings used in Germany.

4653. LAMOND, A. E. A study of the effect of milling profile on the behaviour of flooring under humid conditions. *Aust. Timb. J.* 23 (1), 1957 (43–4, 115).

Floors of *Eucalyptus microcorys*, made of boards of the two standard profiles, i.e. square cut and undercut [illustrated] were exposed to steam supplied through a perforated copper pipe running underneath them and then allowed to dry out. The upper surface of boards in one experiment was coated with bituminous paint to intensify the distortion caused by the treatment. The square-cut boards moved rather less than the undercut.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See No. 4674.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also No. 4703.

4654. ISHAQ, S. M. Wood industries in Sialkot. *Pakistan J. For.* 7 (1), 1957 (20–6).

Describes the manufacture of sports goods, boot lasts, and textile-mill accessories.

4655. The manufacture of wooden shoe soles. *Timb. Technol.* 63 (2188), 1955 (85–6).

Describes the manufacture of wooden soles for ladies' sandals, made on special lathes from Sapele [*Entandrophragma cylindricum*] wood.

4656. Plywood drawing boards. *Veneers & Plyw.* 50 (10), 1956 (39). P.R.

Five-ply Basswood with faces at least $\frac{3}{16}$ in. thick, fitted with Hard Maple end-strips, makes an excellent drawing board.

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See Nos. 4596, 4761.

838. Vehicles (including Ships, Boats, Aircraft)

4657. Moulded wooden car body. *Timb. Tr. J.* Spec. Issue, 1957 (68–70).

An illustrated description of the construction for a Standard 10 sports model with springing adjusted for about half the normal weight. A 2-seater coupé body is also planned. The field to be entered is that of the coach-built body made of aluminium or steel on wooden or tubular framework, and not that of the mass-produced steel pressings. W. J. Coe Ltd. of Ipswich are the makers.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 3973, 4522, 4627, 4768, 4771.

4658. DOSNE, J. J. E. Wood burners and camp stoves. *Pulp Paper Mag. Can.* 57 (3), 1956 (328–30, 333 . . . 50). 73 refs.

A compilation of special information on the use of and features of the most important types of wood burners and camp stoves, bringing together data that were previously scattered through many articles and papers.

4659. RHODE, E. L. Metallreinigung durch Holzblasen. [Cleaning metals by blowing wood particles.] *Zeitschrift des Vereins Deutscher Ingenieure, Düsseldorf* 98 (26), 1956 (1560). [G.] L.D.U.

Blasting with wood particles instead of sand, using a modified type of blower, has proved a very effective method of cleaning soft metals from oil, paint, and oxidation products without injury to the metal surface.

4660. GRANLUND, P., and SKJELMERUD, H. Tørkning av sagspan i pneumatisk røkgasstørke. [Suspension drying of sawdust by exhaust gases.] *Pap. ja Puu* 39 (3), 1957 (87–92). 9 refs. [Nor.nor.e.] P.R.

Experiments with a suspension drier and drum driers heated by steam or flue gas showed that in suspension drying both initial costs and operating expenses are lower than with drum driers. It was concluded from tests that a suspension drier should have gas inlet and outlet temperatures of 500–600° and 115–125° C. respectively, and that the rate of passage of gas through the vertical duct should be 8–10 m./sec. A design for a drier meeting such requirements and with a capacity of 250 kg. dry sawdust per hour, drying from 100% to 10% m.c. is illustrated diagrammatically. Heat consumption was ca. 900 kcal./kg. moisture removed.

4661. MILES, N. S. Sawdust and straw. *Agricultural Journal, Fiji* 25 (3/4), 1954 (63–4). O.R.E.

Practical notes on their use as fertilizers under Fiji conditions. Sawdust, composted with animal manure, 3/1 by volume, or nitrochalk 20/1 by weight, needs monthly turning to eliminate insect larvae, particularly those of rhinoceros beetle.

4662. **Cost of getting chips from small-sawmill residues.** *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (6-8).

A comparative study of 10 methods of processing and transporting showed that, despite higher transport costs, it was more economical to concentrate barking and chipping at the pulpmill or at special concentration yards situated midway between it and the small sawmill.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 4153, 4625, 4694-5, 4702, 4730.

4663. HATFIELD, I. **Activities in the field of wood products preservation in the United States in 1955-56.** *For. Prod. J.* 7 (2), 1957 (54-60). 124 refs.

Includes a list of new or revised specifications for preservatives and their application.

4664. TAMBLYN, N. **The durability of Eucalypt timbers and their preservative treatment.** *Final Rep. World Eucalyptus Conf., Rome 1956*, 1956 (181-9). [E.]

Discusses natural resistance to woodboring insects, termites, marine borers and fungi, and its relationship to density, listing data for 70 species; the effect of durability on uses; preservative practices in general and for specific purposes (particularly a recently developed high-pressure oil treatment for sleepers); and research programmes.

4665. ABE, H., and MATSUOKA, S. **[Resistance to leaching and decay protection of various wood preservatives by shaking method.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 87, 1956 (25-31). 3 refs. [Jap.e.]

Using *Cryptomeria* sapwood blocks $1 \times 2 \times 4$ cm., the resistance to leaching of 1-3 concentrations each of 11 preservatives was tested against 3 fungi, results for *Poria vaporaria* being tabulated. The method is recommended as allowing of the simultaneous testing of a large number of blocks, but the frequency and amplitude of shaking require further tests.

4666. PRICE, E. A. S. **Correlating laboratory and field tests on the behaviour of a wood preservative towards soft rot.** *Wood* 22 (5), 1957 (193-6). 10 refs.

In tests to determine preservative concentrations giving adequate protection under very severe conditions, good correspondence was found (but not proved significant) between the weight loss of impregnated Beech blocks, leached for 28 days and plated on *Chaetomium globosum*, and that of impregnated Scots Pine exposed in a cooling tower. The preservative used contained $K_2Cr_2O_7$, $CuSO_4$ and As_2O_3 . Other preservatives will be similarly tested.

4667. SCHULZE, B., and MÜLLER, R. **Das Verhalten anorganischer für den Holzschutz wichtiger Fluorverbindungen im Holz.** [The behaviour

in wood of the inorganic fluorine compounds important for wood preservation.] *Holzforschung, Berlin* 10 (4), 1956 (97-108). 17 refs. [G.g.e.] P.R.

The authors applied two methods to determine quantitatively the separation, after impregnation, of volatile F compounds from preservatives containing F: (1) determination of residual F after incinerating the wood, and (2) extraction by suitable solvents and subsequent determination of separated F compounds. The tests included some of aged specimens, and some biological tests. It was found that all F compounds tested (bifluorides, silicofluorides and fluorides) are decomposed in wood, yielding perceptible quantities of volatile F products. Bifluorides are characterized not so much by the release of greater quantities of F, as by a gas-production rate differing from that of other F compounds; they release, in the first months after impregnation, large amounts of HF, the rate then diminishing rapidly, so that after a year there is hardly any HF production. F preservatives of the two remaining groups release much less of the volatile compounds in the first period, their efficacy lasting considerably longer. Results, presented in tables and graphs, enable the time factor to be determined in the quantitative testing of preservation processes. Of commercial preparations, only 'Osmol WB4' (a bi-fluoride preparation) was tested; no substantial change was found in the F content during a 3-year period (2 and 5 years after impregnation). Since this preparation is known to be active after 5 years, its service duration may be assumed to be ≤ 10 years.

4668. **Wood treated with lycticides.** *Aust. Stand. No. O.60*, 1956. pp. 12. Price 4s. P.R.

For prevention of *Lyctus brunneus* attack, the standard specifies minimum concentrations in the core of H_3BO_3 0.2% (or the equivalent as borax), NaF 0.1%, and Cl equivalent to 2% (in the form of Seekay Wax A 123). Branding and the determination of m.c. and preservative content are also dealt with.

4669. HATFIELD, I., and ALLEN, R. VAN. **Termite-repelling wood preservative.** *Pest Control* 24 (10), 1956 (32, 34, 78). D.S.I.R.

Describes a new coating composition based on PCP in emulsion, and the method of applying it to wood.

4670. **Pentachlorophenol for timber preservation.** *S. Afr. Bur. Stand. Specif. No. S.A.B.S. 42*, 1956. pp. 16. [E.Afr.] Price 5s. P.R. [Cf. F.A. 11 No. 3073.]

4671. **Solid tetrachloronaphthalene and tetrachloronaphthalene-pentachlorophenol timber preservative.** *S. Afr. Bur. Stand. Specif. No. S.A.B.S. 579*, 1956. pp. 18. [E.Afr.] Price 5s. P.R.

4672. **Pentachlorophenol-zinc naphthenate timber preservative.** *S. Afr. Bur. Stand. Specif. No. S.A.B.S. 565*, 1956. pp. 16. [E.Afr.] Price 5s. P.R.

4673. **Metallic naphthenates for timber preservation.** *S. Afr. Bur. Stand. Specif. No. S.A.B.S. 38*, 1956. pp. 15. [E.Afr.] 1st revision. Price 5s. P.R. [Cf. F.A. 11 No. 3070.]

4674. GOLDFARB, S. New preservative for reusable wooden containers and pallets. *Wooden Box and Crate, Washington* 18 (1), 1956 (23-8). 4 refs. P.A.T.R.A.

Wooden baskets and crates treated by a 20-second dip in a water-repellent solution of Cunilate (solubilized Cu 8-quinolinolate) withstood prolonged rigorous, accelerated decay and mildew tests in (a) a tropical humidity chamber and (b) a refrigerated chamber. In (b) carrots stored in treated containers were sound, while the untreated containers and their contents were mouldy. The dip greatly reduced dimensional changes of wood due to moisture absorption. Because of its relatively low toxicity, and freedom from unpleasant odour or flavour, the preparation is recommended for use in food-processing plants, wooden refrigerator parts, and also greenhouses and frames etc.

4675. PANEK, E. Influence of fungus infection associated with chemipeeling on pressure impregnation and cold soaking of Jack Pine posts. *For. Prod. J.* 7 (4), 1957 (124-7).

Posts were cut: (1) from unpoisoned trees and (a) dipped in 3% Na PCP to discourage growth of moulds, (b) sprayed with 3% NaF to encourage growth of moulds or (c) left untreated; (2) one week after poisoning the trees with Na arsenite; and (3) 4 months after poisoning. After air seasoning, microscopical examination showed no, or hardly any, hyphae and generally closed ray parenchyma cells in (1a), scattered hyphae and mostly closed parenchyma cells in (1c) and (2), but abundant hyphae, mostly of *Trichoderma*, in (1b), and of various moulds and stains in (3), most of the ray cells being open. In treatments with a 50/50 mixture of creosote and No. 2 fuel oil, both sapwood penetration and preservative retention were markedly superior in (1b) and (3), though the differences were not so marked in the Rueping process (where penetration was 100% in all cases) as in the 6-hour and 48-hour soaking treatments.

4676. ELLWOOD, E. L. Sub-project P.10-5. Pressure treatment of Douglas Fir. Progress report No. 1. Comparative treatability of Douglas Fir and Radiata Pine under high pressures. Division of Forest Products, C.S.I.R.O., Melbourne. 1956. pp. 8 + 2 plates. Limited distribution.

Douglas Fir was subjected to pressure treatments for applying creosote, ranging from 250 to 1000 lb./sq. in. At 1000 lb./sq. in. there was considerable collapse and splitting, with inadequate penetration and retention, whereas Radiata Pine, included for comparison, was completely penetrated and showed no visible damage. The maximum pressure that could be used for Douglas without distorting the specimen was 300 lb./sq. in. for 2 hours with creosote at 130° F. The possibility of treating at a basic pressure of 150 lb. with recurrent increases to e.g. 800 lb. is discussed. No loss of toughness occurred with pressures below 600 lb.

4677. MILLER, D. J., and GRAHAM, R. D. Full-cell treatment of kiln-dried coast-type Douglas Fir

piling with creosote and creosote-coal tar. *Rep. Ore. For. Prod. Lab. No. P-2*, 1957. pp. 7 + 4 photos. P.R.

Results of full-cell tests on kiln-dried sections of Douglas-Fir poles showed that the piling was more difficult to treat with creosote/coal-tar than with creosote alone. It appears that kiln drying of green round Douglas Fir before preservative treatment is feasible.

4678. JÍLEK, Č. K otázce hluboké impregnace smrkových a jedlových sloupů. [The problem of deep impregnation of Spruce and Silver Fir poles.] *Dřevo* 11 (9), 1956 (231-4). [Cz.] P.R.

Presents the results of trial impregnations in 1955/56 of 100 Spruce and Silver-Fir poles (unbarked and barked) with creosote. The poles (winter felled) were mostly pre-treated by spraying with water for 2 or 4 months and impregnated [after an unspecified interval] by the Rueping and Bethell methods. The Rueping method (pressure applied for 1-1½ hours) was found to give better results than the Bethell: the uptake was greater (60.5-89.7 kg./cu.m.) than that prescribed by Czechoslovak standards, and the depth of penetration was 18-21 mm. The period between felling and water treatment did not exceed 14 days. Trials with a 5% solution of PCP (Na salt) were as encouraging as with creosote.

4679. KELSO, W. C., JR., and BEHR, E. A. Effect of final steaming on distribution and permanence of pentachlorophenol in air-seasoned Southern Yellow Pine pole sections pressure treated with pentachlorophenol-petroleum. *For. Prod. J.* 7 (5), 1957 (178-86). 4 refs.

Steaming after empty-cell pressure treatment, practised to improve cleanliness, produced, on the whole, no significant differences in the gradients of PCP and solvent contents at varying depths, either immediately or after 4 months' horizontal storage. The process removed ca. 19% of the solvent, and increased the mean losses during the storage from 1.3 and 29.3% to 5.9 and 34.1% respectively. In the outer 1-in. zone, solvent losses during storage were much higher than PCP losses. For both steamed poles and controls, PCP content of the outer ¼ in. increased, and in the subsequent ¾ in. decreased in storage. For the treated poles, this decrease occurred also in the 2nd inch. [Cf. *F.A.* 17 No. 2100.] *From authors' summary.*

4680. GILLWALD, W. Flüssigkeitsbewegung im Holz bei der Vakuumdrucktränkung. [Movement of liquids in wood during vacuum-pressure impregnation.] *Holzindustrie, Berlin* 9 (9), 1956 (232-5). [G.] F.D.C.

In the method used by the author to study the movement of preservative solutions, the solution was fed under pressure to one of the 5 × 5 cm. faces of a test-piece 50 × 5 × 5 cm., and a vacuum was applied to the other end face. Electrode pairs with a point distance of 15 mm. were driven into the test-piece at 50-mm. intervals. A potential of 24 volts d.c. was applied to each electrode pair, and the resistance was measured by an ohmmeter, using a selector switch. The rate of movement of the aqueous liquid was measured by determining the

time required for each electrode pair to reach the same resistance value. This rate was found to depend on the surface tension of the liquid and, to a larger extent, on its viscosity. The author argues that, macroscopically, wood represents a system not unlike a heap of sand grains in which the flow is always laminar because of the very low Reynolds number. The linear relationship between the flow rate and the pressure applied, known from the law of filtration, is valid only if the permeability of the system remains constant. This is not the case when the maximum pressure is applied at the outset of the impregnation process, because the small pores and channels are compressed. Permeability can be kept constant if the pressure is raised gradually, the required rate of increase depending on properties of the wood and impregnant, and on temperature. From the point of view of microscopical structure it was found that while the measured rate of flow in Pine sapwood of 18–22% moisture content never exceeded 2.5 mm./min., the calculated theoretical value was 39 mm./min. for unobstructed capillary tubes 50 mm. long, having a lumen equal to that of the tracheids. The specific flow was thus 15.6, equivalent to a specific resistance of ca. 1.25 per pit membrane (assuming 2.5 pits per cm. length in the grain direction). The final conclusion is that the finer the membrane pores, the smaller should be the difference between the two sides of the membrane; hence wood resistant to impregnation should be exposed to a gradually increasing pressure. A 'three-zone' method of treating Spruce poles is described, involving a preliminary Rueping treatment with creosote, followed by impregnation with UA salts, using a schedule with gradual pressure increase. The peripheral layer is creosote-impregnated, the next layer contains complex salts, and towards the centre more mobile salts are found.

4681. BROWN, F. L., MOORE, R. A., and ZABEL, R. A. Absorption and penetration of oil-soluble wood preservatives applied by dip treatment. *Tech. Publ. N.Y. St. Coll. For.* No. 79, [1956]. pp. 38. 17 refs.

The study was designed to measure the effects of time of immersion and of the sp. gr. and moisture content of wood on the absorption and penetration of a group of oil-soluble preservatives applied by dipping. The materials tested were 5% PCP, 2% Cu naphthenate, 1.1% Cu-8-quinolinolate, 7.5% rosin amine D PCP, and 5% Zn alkyl sulphonate, all prepared with Solvasol No. 5 as the solvent and containing a uniform water-repellent combination of paraffin and Pentalyn H. Conclusions derived from the results (applicable only to the materials and conditions tested) are as follows: M.c. of wood has a marked effect on the absorption and penetration of oil-soluble preservatives applied by dip treatment. Below fibre-saturation point (f.s.p.), transverse penetrations are not measurably affected by changes in m.c., but longitudinal penetration and total absorption are significantly affected. Initial absorption does not vary appreciably with changes in m.c. below f.s.p., but decreases at m.c.'s above f.s.p. In oven-dry wood, the initial absorption accounts for ca. half the total absorption, and this proportion increases with an increase in m.c. An increase in

sp. gr. of wood causes a slight decrease in absorption and penetration; this effect decreases with an increase in m.c. No important differences were apparent in the absorption and penetration characteristics of the several preservative solutions. Maximum penetration occurred along the grain, and least in the tangential direction; in the absence of appreciable exposed end-grain, low transverse penetrations may limit the utility of dip treatments.

4682. BECKER, G., and STARFINGER, K. Studies on the liquid absorption in dip treatment of Pine and Spruce wood. Third report: effect of the properties of preservatives on the liquid absorption in short-dip treatment of Pine and Spruce wood. *Transl. For. Prod. Lab. Can.* No. 104, 1956. pp. 14. 10 refs. Transl. from *Holz Roh- u. Werkstoff* 14 (March), 1956 (95–100). [See F.A. 18 No. 3436.] Limited distribution.

4683. KRZYZEWSKI, J. Treatment of fence-posts of non-durable species with modern water-borne preservatives by the butt diffusion method. *Mimeo. For. Prod. Lab., Can.* No. O-174, 1956. pp. 5 + 2 photos. + 1 tbl. P.R.

120 posts of 4 species were treated by standing the butts of fresh-cut, green, barked posts in various concentrations of chromated $ZnCl_2$. Retentions ranged from 0.41 to 1.42 lb. (dry salt)/cu. ft. Penetrations were as much as 2 in. near the butt, lessening gradually towards the tops, and were confined to the sapwood. Several other species tested in preliminary experiments seem to be suitable for this type of treatment. *From author's summary.*

4684. WÄLCHLI, O. Les champignons sur les poteaux de bois avec mention particulière du bolet destructeur poreux (polypore) (*Poria vaporaria*). [Fungi on wooden poles, with particular reference to *P. vaporaria*.] *Bulletin de l'Association Suisse des Électriciens, Zürich* 44 (1), 1953 (14–20). [F.] L.S.

The normal treatment of poles in Switzerland is by the Boucherie process, using $CuSO_4$. Among the 70 fungus species likely to attack poles, *P. vaporaria* is not susceptible to $CuSO_4$ except at very high concentrations. The causes of the present increased range of *P. vaporaria* are discussed, along with possibilities of a suitable supplementary treatment for poles.

4685. KRZYZEWSKI, J. Durability data on treated and untreated timbers. *Mimeo. For. Prod. Lab., Can.* No. O-105-55 (General), 1956. pp. 59. P.R.

Presents tabulated results of 1309 durability studies conducted in Canada between 1945 and 1955, of which 290 were concluded because of decay and 139 for other causes (without or with decay). Failure due to decay alone has never occurred in pressure-impregnated timbers. [Cf. F.A. 7 No. 1324.]

4686. KRZYZEWSKI, J. Durability data on treated and untreated timbers. *Mimeo. For. Prod. Lab., Can.* No. O-105-55 (Ties), 1955. pp. 15. P.R.

Presents the results of service tests on 137 experimental lots of railway sleepers up to 1955, on 4 Canadian railway lines. Statistical analysis shows

that most sleepers fail, not because of decay but because of mechanical failure under service conditions. [Cf. *F.A.* 7 No. 1324.]

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

4687. CLERMONT, L. P., and BENDER, F. The effect of swelling agents and catalysts on the acetylation of wood. *For. Prod. J.* 7 (5), 1957 (167-70). 8 refs.

Reports on (1) preliminary liquid-phase experiments, chiefly with Black Spruce sawdust, to test the effect of amount of catalyst and impregnant in the wood, temperature, moisture content, catalyst and acetic-anhydride concentration in the acetylating medium, and (2) experiments with $\frac{1}{8}$ - or $\frac{1}{16}$ -in. veneers of Black Spruce, White Birch and Aspen, esterified by a vapour-phase technique. Three variants were tried: (a) impregnation with urea/(NH_4)₂SO₄ and exposure to acetic-anhydride vapour; (b) impregnation with K acetate and exposure to mixed vapours of dimethyl formamide and acetic anhydride; and (c) impregnation with dimethyl formamide and exposure to phenylisocyanate vapour. Methods (a) and (b) gave acetyl contents of ca. 30% in the veneers, and anti-shrink efficiencies of ca. 70%, accompanied in (a) by a loss of strength in terms of modulus of rupture. Method (c) produced good anti-shrink efficiencies and slightly increased strength.

4688. GOTÔ, T., and KADITA, S. [Studies on impregnated woods. IX. Relationship between the moisture content during the curing of wood impregnated with phenol resin and dimensional stability.] *J. Jap. Wood Res. Soc.* 2 (2), 1956 (85-7). 5 refs. [Jap.e.e.] P.R.

Results of tests on 1 × 5-cm. (fibre × tangential direction) test-pieces of *Chamaecyparis obtusa* and *Betula* sp., using methods described in previous papers [see *F.A.* 17 Nos. 3378-9] show that: (1) the optimum range of m.c. for the curing process, to obtain dimensionally stabilized wood, is 6-10%, and (2) the dimensional stability of heat-treated wood is not improved when the m.c. at the time of treatment is 6-12%.

844. Attack by Plant Organisms

See also Nos. 4149-50, 4569, 4738.

844.1. Sap-staining and Mould Fungi

See Nos. 4675, 4697, 4699, 4714, 4730.

844.2. Wood-destroying Fungi

See also Nos. 4219-37, 4570, 4594, 4664-6, 4684.

4689. JØRGENSEN, E. A method for the study of mycelial anastomoses [of wood-destroying fungi]. *Friesia, København* 5 (1), 1954 (75-9). 5 refs. [E.e.] I.M.I.

Describes an oil-cell method, using liquid paraffin and glass slides, for studying the formation of anastomoses.

4690. NEČESANÝ, V., and JURÁŠEK, L. Změny submikroskopické struktury dřeva, napadeného bílou hnilobou. [Changes in the submicroscopic structure of wood attacked by white rot.] *Lesn. Čas.* 2 (1), 1956 (43-52). 11 refs. [Cz.cz.russ.g.]

Presents the results of an electronographic study of attack by *Panus stipticus* on *Pinus sylvestris* wood. The enzymes secreted by the hyphae first attack the innermost layer and expose the middle layer of the secondary wall. Further decay of the middle layer in the tracheids is seen best near the bordered pits. The lignin between the bundles of cellulosic fibrils disappears first. In the bordered pits, initial attack first changes the shape of the orifice to an ellipse and at the end of this ellipse there appear deep tongue-shaped grooves, parallel to the fibrils. Regularly distributed, fine, filament-like branched forms can be seen on the attacked surface. The surface structure of the hyphae is finely fibrous, with fibrils slightly deviating from the hyphal axis.

4691. WATERMAN, A. M., and HANSBROUGH, J. R. Microscopical rating of decay in Sitka Spruce and its relation to toughness. *For. Prod. J.* 7 (2), 1957 (77-84). 5 refs.

Sitka Spruce blocks were subjected to decay in pure cultures of 5 brown-rot and 3 white-rot fungi, and the degree of decay rated in 8 classes according to the extent of the presence of hyphae, bore holes, and decomposition of cell walls in the individual tracheids of a microscopical field. Decay ratings and toughness ratings (resistance to suddenly applied loads) were combined for test pieces cut from two boards naturally infected with *Poria monticola*. The relationship found was highly variable but there seemed to be a clearly defined association of average values for both factors. Toughness reductions in Sitka Spruce, are not likely to be serious if the rating does not exceed 2 (bore holes only in 1 tracheid). More research, possibly using less variable strength properties, is advocated.

4692. LOHWAG, K. Über den Einfluss des Nährbodens auf das Wachstum holzerstörender Pilze. [Effect of the nutrient medium on the growth of wood-destroying fungi.] *Holzforsch. u. Holzverwert.* 9 (2), 1957 (25-6). 5 refs. [G.g.e.] P.R.

The author found that the presence of peptone in the media improved the growth of mycelium and the wood-destroying activity of *Coniophora cerebella*, but *Lentinus squamosus*, *Lenzites abietina* and *L. saeiparia* are better cultured on peptone-free media.

4693. MIZUMOTO, S. [Studies on *Lenzites abietina* Fr. and some of its allied species. (V) Carbon sources of *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr., and *L. saeiparia* (Wulf) Fr.]. *J. Jap. For. Soc.* 38 (2), 1956 (71-3). 2 refs. [Jap.e.e.]

Of the sources of C tested, sucrose gave the best results, followed by glucose, maltose and lactose, with galactose, fructose, and soluble starch again slightly inferior, and glycerine and mannitol giving the poorest mycelial growth. From author's summary.

4694. MIZUMOTO, S. [Studies on *Lenzites abietina* Fr., and some of its related species. (VI).

Effect of sodium pentachlorophenate on *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr., and *L. saepiaria* (Wulf.) Fr.] *J. Jap. For. Soc.* 38 (3), 1956 (111-4). 7 refs. [Jap.jap.e.e.]

The lowest concentrations needed to check the growth of the 4 *Lenzites* spp. on agar medium ranged from 0.0006 to 0.0008%, and that needed to check *Polystictus sanguineus* was 0.002%. Wood blocks dipped in a 5% solution in water of Na pentachlorophenate showed no sign of decay, but dipping in a solution of < 1% was not effective. *From author's summary.*

4695. MIZUMOTO, S. [Studies on *Lenzites abietina* Fr. and some allied species. VII. Effect of creosote on mycelial growth and the decay of Beech sleepers.] *J. Jap. Wood Res. Soc.* 2 (3), 1956 (95-8). 4 refs. [Jap.e.] P.R.

Mycelia of *Lenzites abietina*, *L. subferruginea*, *L. trabea*, *L. saepiaria* and *Polystictus sanguineus* did not grow on an agar medium containing 0.1% of creosote. Again, blocks from untreated Beech sleepers decayed rapidly [when exposed to these fungi?], whereas those from sleepers impregnated with creosote by the Bethell process proved highly resistant to fungal attack. However, wood blocks with a large % of false heart, which is refractory to impregnation, decayed more readily.

4696. MIZUMOTO, S. [Studies on *Lenzites abietina* Fr. and some of its allied species. (VIII). Nitrogen sources of *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr. and *L. saepiaria* (Wulf.) Fr.] *J. Jap. For. Soc.* 38 (8), 1956 (311-3). 7 refs. [Jap.jap.e.e.]

4697. WAGENFÜHR, R., and STEIGER, A. Pilze auf Bauholz. [Fungi on building timber.] A. Ziemsen Verlag, Wittenberg. 1956. pp. 64. 22 refs. [G.] Price DM.3.25.

A short, practical, illustrated guide, describing the chief fungi (including stain fungi) attacking timber in buildings, mines, and out of doors, with a key and table for identification and a list of wood preservatives approved in E. Germany.

4698. FUJII, J. S., BRYANT, B. S., and ERICKSON, H. D. The mechanical properties of [Douglas Fir] white-speck lumber, veneer and plywood. College of Forestry, University of Washington, Seattle. 1956. pp. 43. 11 refs.

A detailed review of literature, reproducing test data, tables etc.

4699. MUTANEN, K. Havaintoja sinistymisen ja varastolahon esiintymisestä kuorituilla mänty-tukeilla. [Observations on the occurrence of blue-staining and storage rot in barked Pine logs.] *Årsb. Finl. Flottarefören.* No. 25, 1956 (1957), (43-50). 6 refs. [Fie.]

Several investigations have shown that defects are often caused in handling after felling; blue-stain and rot often arise from splitting during handling. The author discusses results from his investigations on blue-stain and storage rot in storing and floating barked Pine logs. *From author's summary.*

4700. FRITZ, C. W. Decay in Poplar pulpwood in storage. *Canad. J. Bot.* 32 (6), 1954 (799-817 + 2 plates). 17 refs. O.R.S.

The deterioration of pulpwood of *Populus tremuloides* and *P. balsamifera* was studied in field and pit stacks and in open piles on Manitoulin Island, Ontario, between 1950 and 1954. The rots most important in the living trees are the white stem rots caused by *Fomes ignarius* var. *populinus*, *Radulum casearium*, *Polyporus dryophilus* var. *vulpinus*, a rot designated as Fungus X, and the brown rot produced by *Poria cocos*. Only *P. cocos* spread vigorously in storage. The most common fungi infecting the trees after felling were *Stereum purpureum*, *Polyporus adustus*, *Polyporus hirsutus* and *P. versicolor*, which produce white rot and sometimes lead to advanced decay. Most of the loss in volume from decay during storage was caused by fungi that entered the wood after the tree was felled.

4701. ATWELL, E. A. Decay and discolourations in Poplar pulpwood. *F.P.L. tech. Note For. Prod. Lab. Can.* No. 1, 1956. pp. 24. 10 refs.

The darkening of Aspen [*Populus tremuloides*] pulps, by discolorations present in the bolts at the time of grinding, has caused much concern to manufacturers. Some 200 Aspen pulpwood bolts with representative discolorations were analysed before and after storage in the field and in pits, to determine the identity and viability of the causative fungi. It was shown that the discolorations originate for the most part in the living tree, following attack by heartwood-rotting fungi which, with the exception of *Poria cocos*, cause no appreciable further damage during storage. Damage during storage results chiefly from sapwood-rotting fungi which enter the bolts during storage, and to a limited extent from *P. cocos*. Decay occurring during storage is not accompanied by discoloration that would, to any appreciable extent, affect the colour of the pulp.

4702. DUTEIL, H. Écorçage manuel en sève de bois de papier feuillu et traitement à l'aide de produits antiseptiques. [Hand barking of freshly felled Beech and Hornbeam pulpwood, and its treatment with preservatives.] *Rev. for. franc.* 9 (5), 1957 (385-96). [F.]

A preliminary report on an experiment designed to compare the time taken to bark by hand Beech and Hornbeam pulpwood (a) 'in sap' immediately after felling, and (b) after storage, and also the cost in time and money, and efficiency, of treating (a) by dipping in a preservative solution after barking and before stacking for storage in the wood. The preservatives used were Xylophène Na and Cryptogil Na. Results (tabulated and graphed) indicate that method (a) + dipping takes appreciably less time than (b). Costs of barking and stacking for wood of 15-19 cm. diam. were 610-500 fr./stère for (b) and 560-326 fr. for (a), including time for dipping. The cost of the preservative averaged 50 fr./stère. Preliminary results indicate that barked, treated wood stacked in the forest was perfectly sound after 9 months; wood barked but

not treated showed very little decay but was largely covered by moulds; unbarked wood was heavily attacked.

4703. TRAUTVETTER, R. Mykoholz—ein Werkstoff mit neuen Eigenschaften. [*'Mykoholz'—a material with new properties.*] *Holzindustrie, Berlin* 9 (9), 1956 (238–41). [G.] F.D.C.

W. Luthardt (Thuringia) is said to have developed a method of controlled decay of wood, using specially selected and bred pure fungus cultures, to obtain products possessing some of the following properties: lower density, greater porosity, better whittling, freedom from stresses and penetrability by different liquid impregnants. One of the main uses of this material is in the pencil industry, where it could advantageously replace imported *Juniperus virginiana* wood. Other uses include artificial limbs, 'polishing wood' for watchmaking, musical instruments, draughtsmen's aids, filtering media, and battery separators. To obtain the new material, freshly felled Beech of small d.b.h. is cut into sections 20–40 or 60–80 cm. long, depending on the ultimate use, after which both end surfaces are coated with a paste made from sawdust and pure cultures of *Pleurotus ostreatus*, *Pholiota mutabilis* or *Polystictus versicolor*, the bark being left on. The sections are left for 3–4 months in suitable climatic conditions. It is claimed that during this period they undergo a strictly reproducible, uniform softening throughout the wood. [Cf. *F.A.* 17 p. 141.]

845. Attack by Animals

See also No. 4738.

845.1. Marine Borers

See also No. 4664.

4704. HAHN, A. Die Bekämpfung der Bohrmuschel. [Control of *teredo*.] *Küste* No. 5, 1956 (49–72). Many refs. [G.] From abstr. in *Holz-Zbl.* 83 (84), 1957 (1047).

Discusses biology and occurrence of and injuries caused by *teredo* on the German coast, particularly at Cuxhaven, and describes research stations at Norderney, Wilhelmshaven, Cuxhaven, List auf Sylt, Holtenau, and Chioggia near Venice, with their research projects, including first results of trials with various preservatives, of which creosote has so far proved the best. There is also a section on hydrographical factors (pH, salt and O contents, temperature) as they affect marine borers.

4705. OSMASTON, H. A. A fresh-water wood-borer. *Emp. For. Rev.* 36 (2), 1957 (207–8). 4 refs.

Notes the existence of *Povilla adusta* in Lakes Victoria and Lutoto, Uganda. Damage to *Cordia millenii* was observed, but *Chlorophora excelsa* appeared to be resistant.

4706. EDMONDSON, C. H. Resistance of woods to marine borers in Hawaiian waters. *Bulletin of the Bernice P. Bishop Museum, Honolulu* No. 217, 1955, pp. 91. 38 refs.

Presents data and discusses the reactions of 351 species, belonging to 69 families (60% of them grown in Hawaii) when exposed to marine-borer

attack for periods ranging from a few months to 6 years. With few exceptions, green wood was more resistant than seasoned, and heartwood than sapwood, but this differentiation usually lasted only a few months. Barks of some timbers offered more or less protection against marine borers, and in some woods this security seemed to last as long as the bark remained intact, but the barks of many species softened in sea water and disintegrated in 12–18 months. The results of these tests confirmed existing evidence that the resistance of a timber to marine borers is closely related to its Si content. Tannins, when acting alone, even in heavy amounts, do not usually long delay the action of marine borers. Some woods, however, such as certain species of *Vitex*, with only a trace of Si and no alkaloids, but with a high tannin content, showed marked resistance; it is possible that other toxic elements may supplement the tannins in these species. Heavy alkaloid contents occurred in only a few of the specimens analysed, and seemed not to prevent attack, but some resistant barks (e.g. *Cinchona* sp., *Litchi chinensis* and *Araucaria bidwillii*) showed a combination of light alkaloid and medium tannin content that may account for their relative resistance. Oils, acids, and resins doubtless discourage the action of marine borers in some woods. An association of acid and resinous material is believed to be responsible for the resistance of *Callitris glauca*. *Taxodium distichum* varied greatly in resistance, specimens containing large amounts of resins and gummy substances appeared to be more resistant than either sapwood or heartwood lacking them. Of the 69 families here reported on, few include more than 3–4 species with marked resistance, and even within a genus there may be found highly susceptible as well as highly resistant species. The following species are listed as promising prolonged durability in sea water: *Antidesma platyphyllum*, *A. pulvinatum*, *Callitris glauca*, *Carinaria pyriforiformis*, *Dicorynia paraensis*, *Eschweilera sagotiana*, *Eusideroxylon zwageri*, *Lecythis paraensis*, *Licania densiflora*, *Metrosideros petiolata*, *Vitex pinnata* and *Vitici-premna novae-pomeraniae*.

4707. MENON, K. D. A note on marine borers in Malayan waters. *Malay. Forester.* 20 (1), 1957 (32–7). 3 refs.

Gives notes on *Martesia stricta*, *Teredo* sp., *Bankia* sp., *Limnoria* sp. and *Sphaeroma* sp. found in Malayan waters, and lists the principal Malayan timbers, with notes on resistance to attack by different types of marine borer.

4708. JOHNSON, M. W., and MENZIES, R. J. The migratory habits of the marine gribble *Limnoria tripunctata* Menzies in San Diego harbour California. *Biological Bulletin, Marine Biological Laboratory, Woods Hole, Mass.* 110 (1), 1956 (54–68). 13 refs. O.R.S.

Migration reached its height during the season of highest water temperatures; floating or submerged wood were equally attacked. The constitution of populations at the time of migration, the factors causing it, and the effect of higher water temperatures on breeding are discussed.

845.2. Terrestrial Borers

See also Nos. 4307, 4330, 4338, 4350, 4664, 4668.

4709. LYNNGES, R. A useful chalcidid, *Trigonoderus tristis* Walk. *Z. angew. Ent.* 39 (3), 1956 (368-75). 3 refs. [E.e.g.] O.H.

Describes the morphology, bionomics, and habits of this chalcid, found as a parasite of *Anobium punctatum* in S. Norway.

4710. MENON, K. D. Susceptibility of commercial species of Malayan timbers to powder-post beetle attack. *Malay. Forester* 20 (1), 1957 (19-23). 4 refs. Also as *Trade Leaflet, Malay. For. Serv.* No. 27.

Lists some 50 timbers, by their trade names and divided into 3 groups (heavy, medium, and light), with susceptibility rating in respect of *Minthea rugicollis* (immune and rarely, moderately, or highly susceptible).

4711. CACHAN, P. Les Scolytoidea mycétophages des forêts de Basse Côte-d'Ivoire. Problèmes biologiques et écologiques. [Ambrosia beetles of the Lower Ivory Coast. Biological and ecological problems.] *Rev. Path. vég.* 36 (1/2), 1957 (1-126). 76 refs. [F.] I.M.I.

Round billets of 30 timbers were exposed in two forest types. Ca. $\frac{1}{3}$ were markedly attacked and ca. $\frac{1}{2}$ were unaffected. Economic species among the former were *Khaya ivorensis*, *Lophira procera*, *Entandrophragma angolense*, and *Piptadenia africana*. Among those scarcely or not at all attacked were *Chlorophora excelsa*, *Tarrietia utilis* and *Turraeanthus africana*. Data on the incidence of attack on the specimens are analysed according to length of exposure (1-5 weeks); surface, (upper, lower, end sections); with and without bark; exposure in two forest types. The host timbers of 25 species of insect are listed. Part II deals with the biology of the adults and larvae of *Platyscapulus auricomus*, especially their food, the sowing and placing of ambrosia fungi, the exclusion of other fungus species and the specificity of the insect/fungus/tree associations. The techniques used for investigating the substances that attract this insect, apparently exclusively, to species of *Macrolobium*, and some of the results obtained, are described. Some types of apparatus offer the actual paper chromatograms to the freely moving insects, which indicate the attractants by congregating on the corresponding spots of the chromatogram. An essential part of such apparatus is a deck with a ceiling 2 mm. above it simulating the height of a gallery. Part III includes comprehensive ecological data: the effect of temperature and humidity on the life of larvae and ambrosia fungi, and on the longevity of the adults; seasonal distribution (including differences in number of females), geographical, climatic, vegetational distribution, and coincidence of range with that of *Macrolobium*.

4712. PREBBLE, M. L., and GRAHAM, K. Studies of attack by ambrosia beetles in softwood logs on Vancouver Island, British Columbia. *For. Sci.* 3 (1), 1957 (90-112). 10 refs.

In these studies the species encountered were *Platypus wilsoni*, *Xyleborinus tsugae*, *Gnathotrichus*

retusus, *G. sulcatus* and *Trypodendron lineatum*, only the last two being consistently present. The object was to determine whether damage by different species could be related to date of felling and period of exposure. Samples were taken from 630 logs (Douglas Fir, Western Hemlock and Amabilis Fir) in 96 combinations of felling and examination data. Life histories, gallery pattern, the distribution and intensity of attack and damage indices are illustrated, tabulated and discussed. Each beetle has fairly distinctive and consistent patterns of attack. Risk of damage in the Hemlock or Fir is low in logs felled in May or later, and in the Douglas in logs felled in June or later if the logs are removed from the woods before the end of the following March.

4713. KINGHORN, J. M. Two practical methods of identifying types of ambrosia beetle damage. *J. econ. Ent.* 50 (2), 1957 (213).

The diameter ranges of the entrance holes of two species [*Trypodendron lineatum* and *Gnathotrichus sulcatus*] did not overlap even after swelling caused by wetting. They could be separated by testing with a No. 52 wire gauge (0.0595 in.) twist drill that would enter the smallest hole of the one but not the largest of the other species. Differences in boring dust (extruded before larval frass is due) are also diagnostic, separating, in a case instanced, even two congeners. These methods obviate cutting into the wood.

4714. TUOVINEN, A. Hyönteiset vaarana kuorellisille mäntytukeille. [Insects a danger to unbarked Pine logs.] *Tied., Metsäteho, Helsinki* No. 128, 1957. pp. 4. [F.e.]

Damage was chiefly by *Blastophagus minor*, especially in butt logs, and *Ips acuminatus* causing bluestain especially in middle and top logs. Deterioration was most pronounced in the upper layer of logs stacked on skids and in open storage sites; it started on the lower surface of the logs. Deterioration was similar for all diameter classes. The logs were stored in bundles in a log pond from June. When the bundles were opened in September/October the number of logs stained in the upper part of the bundle was double, and the spread of the stain 4 times, that in the lower part of the bundle. DDT spraying in April was unsatisfactory, as the carrier did not adhere sufficiently firmly to the surface of the timber.

845.3. Termites

See also Nos. 4289-91, 4590, 4664, 4669.

4715. MATHIEU, H. Le péril des termites en France. [The danger from termites in France.] *Bois et Scieries, Paris* 63 (2; 4), 1957 (19... 25; 87-91). 12 refs. [F.]

An account of the termites occurring in France (*Calotermes flavicollis*, *Reticulitermes santonenis*, *R. lucifugus*), their biology and habits, damage and control measures.

4716. Termite investigations. *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (67).

Tests on a group of commercial timbers indicate that they may be arranged in the following order of

decreasing resistance to termite attack: *Eucalyptus rostrata*, *E. propinqua*, *E. punctata*, *E. saligna*, *E. eugenioides* and *E. sieberiana*.

4717. JACKSON, W. F. Termite resistance test on resin bonded wood waste containing BHC. *Malay. Forester* 20 (1), 1957 (49-50).

In Nov. 1950, 24 pieces of resin-bonded chipboard were placed in each of the 3 termite-testing sheds at Kepong, one-third being controls, one-third treated with 0.05% BHC, and one-third with 0.1% BHC. Results after 5 years and 8 months are tabulated and indicate that BHC treatment gives considerable protection against termites.

4718. JOHNSTON, H. R. Soil poisons for subterranean termites. *Occ. Pap. Sth. For. Exp. Sta.* No. 152, 1956. pp. 8.

Presents tabulated data on the effectiveness of various poisons at Gulfport and in the Canal Zone [cf. *F.A.* 17 No. 2160] and gives recommendations for their practical use, remedial or preventive, in the protection of buildings, with a warning about their toxicity, including phytotoxicity.

846. Steaming

See Nos. 4679, 4729, 4753.

847. Drying (Seasoning)

See also Nos. 4539, 4631, 4638-40, 4660, 4677.

4719. List of publications on the seasoning of wood. *Rep. U.S. For. Prod. Lab., Madison* No. 446, 1957. pp. 20. P.R.

Published in May, 1957. Previous edition published in 1956 [see *F.A.* 17 No. 3403].

4720. WRIGHT, G. W. Seasoning [of Eucalypts]. *Final Rep. World Eucalyptus Conf., Rome 1956*, 1956 (170-80). [E.]

Preparation of the material to be seasoned, drying techniques for air and kiln drying, and combined processes, chemical seasoning, reconditioning etc., with tabulated information on 9 species.

4721. KOLLMANN, F. Die Wirtschaftlichkeit der künstlichen Schnittholztrocknung. [The economics of kiln-drying.] *Pap. ja Puu* 39 (3), 1957 (73-6). 9 refs. [G.] P.R.

Discusses the different types of cost (amortization, heating, wages etc.) and stresses the importance of a careful analysis of expenditure.

4722. LADELL, J. L. High-temperature kiln-drying of Eastern Canadian softwoods: drying guide and tentative schedules. *F.P. L. tech. Note For. Prod. Lab. Can.* No. 2, 1957. pp. 18. 5 refs.

4723. KIMBALL, K. E. Devices that measure and control temperature in dry kilns. *Rep. U.S. For. Prod. Lab., Madison* No. 1654 (rev.) 1956. pp. 12 + 1 tbl. + 1 photo + 8 dgms. P.R. [Cf. *F.A.* 9 No. 2444.]

4724. Moisture measuring system. *For. Prod. J.* 7 (4), 1957 (29A).

The 'Kil-Mo-Trol', developed by the Delonhoist Instrument Co., Boonton, N.Y., consists of a

standard moisture detector connected to a station selector at the control board of a kiln by cables with points along the kiln's walls. Contact pins are driven into the lumber where measurements are desired during drying, and connected with the points. The operator is thus able to make tests anywhere in the kiln charge at all stages of the cycle.

4725. Inspection and maintenance of lumber dry kilns and equipment. *Res. U.S. For. Prod. Lab., Madison* No. 1900-4, 1956. pp. 48. 2 refs.

Includes information on: kiln structure; recording and controlling instruments; heating and humidifying, venting and air-circulating systems; kiln trucks; prevention of corrosion; locating troubles in kiln maintenance and operation. Two tables provide data on the coefficients of heat transmission for a number of structural combinations of kiln walls and roofs. Information is also given on the Forest Utilization Service organized by the U.S. Forest Service at 8 of the 9 regional Experiment Stations.

4726. MANN, J. W. How RF concerns the wood industry. *Trans. Amer. Soc. mech. Engrs.* 79 (3), 1957 (603-6). P.R.

Aspects of U.S. federal rules and regulations relating to RF heating and the needs of industry are described. The following subjects are covered in detail, with some examples: means of accomplishing industrial applications; methods of estimating time cycles; the unique properties of the RF field of force, such as selectivity to conductive paths and non-uniformity of the heat placement in dielectrics.

4727. McMILLEN, J. M. Special methods of seasoning wood. Chemical seasoning. *Rep. U.S. For. Prod. Lab., Madison* No. 1665-6 (rev.). 1957. pp. 3. 4 refs. P.R.

Describes the object and principle of chemical seasoning, the use of the proprietary NaCl mixture containing corrosion inhibitors, methods of application, and merits. [Cf. *F.A.* 10 No. 1294; 11 No. 1345.]

4728. [Kiln drying of Red and White Oak treated with urea crystals and a commercial salt with a corrosion inhibitor.] *Rep. Stheast. For. Exp. Sta.* 1956, 1957 (29).

The following results were obtained from 7 kiln runs: In bolt treatment, Red Oak developed more degrade than White; the commercial salt caused less degrade than the crystal urea; application in solid form was better than dipping in a solution; dry-treated White Oak boards can be kiln dried from green to 8-9% m.c. in 10 days without excessive seasoning defects; a straight non-cyclic schedule can be used. Corrosion of kiln equipment needs further study.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 4149-50, 4628-9, 4678, 4699-4702, 4714, 4734, 4748.

4729. BOYE, C., and EGUND, K. F. Forsøg med nedsettelse af revnedannelsen i endefladerne på

bøgefinérkævlér. [Reducing end-checking in Beech veneer logs.] *Træindustrien* 7 (5), 1957 (67-74). 5 refs. [Dan.dan.] P.R.

None of the methods tested (covering the end surface with a paste, making circular cuts, fixing S-irons, or boring a hole 15 cm. deep into the pith in the end surfaces), reduced checking. Steaming the logs before peeling increased checking severely, and 7.5% of the wood of logs so treated had to be discarded. Of logs sawn into planks, 1-2% of the plank volume was fit only for fuelwood.

4730. BOYE, C., and EGUND, K. F. Beskyttelse mod indløb i bøgekævlér. [Protecting Beech logs against discoloration.] *Træindustrien* 7 (3), 1957 (36-43). [Dan.] P.R.

Beech logs left in the forest throughout the summer showed less discoloration (from fungus damage or oxidation) when the ends were treated with any of the preparations tested: Allerød paste, Junckers log grease, Xylamon WBN, Ceremul M or Witoxyl B-23. Results were best when logs were treated immediately after felling, but it proved worth while to treat logs as late as 4 months after felling with some preparation to reduce drying at the ends. Paste gave the best results. An analysis of costs and prices shows that the increase in value/cu. m. is considerably above the expenditure on the treatment.

4731. ALHOJÄRVI, J., and ALM, A. A. The effect of various methods of storage on the formation of bark stain in sulphite Spruce wood (*Picea excelsa*). *Pap. ja Puu* 39 (5), 1957 (265-76). 4 refs. [E.e.fi.] P.R.

Wood completely barked, half-barked, barked in strips or unbarked, was stored for different periods, using various combinations of land and water storage. After storage it was barked, chipped and pulped and the yield, quantity of screenings, and cleanliness and brightness of pulps were determined. Results are shown in graphs and tables. Conclusions are: (1) *Completely barked wood*: Prolonged water storage caused a marked increase in the number of shives, no appreciable variation in the amount of screenings, and the darkest pulp. All these changes were small compared with those for the other degrees of barking. (2) *Half-barked wood*: The number of shives was similar to (1), but reached a maximum after 17 months' water storage and then decreased. Land storage followed by a short water storage gave good results. Storage caused no appreciable increase in screening. Prolonged land or water storage darkened the pulp, and colour was best preserved after short water storage. (3) *Wood barked in strips*: Length of water storage had no effect on number of shives. Land storage gave the best results as regards shives and screenings, but water storage as regards brightness. Short water storage followed by land storage gave the highest number of shives, and cross-wise stacking followed by water storage gave high value of both shives and screenings. (4) *Unbarked wood*: The smallest number of shives was obtained by crosswise stacking followed by water storage, and the largest from wood

stored in water and then on land. The maximum number of screenings was obtained after short water storage. Brightness values were similar to (3).

4732. GUSTAFSSON, C., KAHILA, S., and LINDH, T. Pitch troubles caused by sulphite pulp. IV. The influence of different manners of barking of Spruce wood and of storage successively on land and in water on the amounts of pitch from sulphite pulp deposited on a metal surface. *Pap. ja. Puu* 39 (5), 1957 (277-82). 3 refs. [E.e.fi.] P.R.

Considerably more pitch was deposited from pulp of wood stored on water than on land. Storage on land for 6 months seemed sufficient to prevent an increase in pitch after a subsequent 7-month water storage. After 7 months' storage in water, 12 months' storage on land was needed to reduce pitch to an amount similar to that for land storage. Partial or complete barking appeared to have no effect on pitch.

85. Grading of Wood and Wood Products

See also No. 4627.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 4363, 4400, 4527, 4531, 4568, 4632, 4638, 4653, 4729-31, 4745.

4733. Normenvorschläge für Begriffe der Holzwirtschaft. [Proposed standards for terms used in the wood industries.] *Int. Holzmarkt* 1957 (1; 3), (13-4; 13-4). [G.]

Reproduces 99 definitions of terms for timber defects, proposed by the Fachnormenausschuss Holz, Stuttgart.

4734. PETERSON, O. Sammanställning av forskningens nuvarande kunskap om virkesskador och deras omfattning vid olika transportsätt. [A survey of present knowledge on timber defects and their extent in relation to different transport methods.] *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 8, 1956. pp. 61. 5 pp. of refs. [Sw.]

A survey of research, mainly Scandinavian, under the headings: general description of defects (stain, insect damage, rot, chemical changes, tannin accumulation, mechanical damage); factors affecting choice of transport, and damage (available transport, green density of the wood, seasoning, uptake of moisture, available labour); extent of damage for different methods of handling (damage to round timber, and more specifically to timber and pulpwood, during storage; effect of felling season; damage during transport); defects of hardwoods; damage during storage at the mill.

4735. VINCENT, A. J. A mathematical analysis of the extent of brittle heart in the two common Red Merantis [*Shorea leprosula* and *S. parvifolia*]. *Malay. Forester* 20 (2), 1957 (82-8 + 1 gph.). 18 refs.

Data were collected for 250 trees of *S. parvifolia* and 286 of *S. leprosula*. Linear regressions were found for average diameter of brittle heart at stump height (y) on average u.b. diameter of log at stump height (x), and further analysis showed that the data

could be combined to give a linear regression valid for both species: $y = 0.38x - 0.72$. The cross-sectional area of brittle heart, expressed as a % of total cross-sectional area u.b. at stump height, remains sensibly constant at 12% over the range of diameters encountered in logs used for sawtimber. It is further suggested that: (1) at points on the clear bole above stump height, the same regression equations hold; (2) the incidence of brittle heart for the two species is ca. 80–100%; (3) for a given value of (x), the value of (y) tends to be higher in silviculturally assisted regenerated forest than in forest reserves or primary jungle.

4736. SCHÖPFER, W. Beobachtungen über das Aufreissen von Buchenstämmen im staatlichen Forstbezirk Heidelberg. [The splitting of Beech stems in the Heidelberg state forest district.] *Holz-Zbl.* 83 (56), 1957 (715–6). [G.G.]

Of 250 Beech logs of good quality and medium size, those having large or marked butt swellings showed fewer and less serious splits than logs cut above the swelling or without any. Where cuts were made through a main crotch, no splitting at all occurred, and through branch crotches, no serious splits.

4737. ASANO, I. [Studies on collapse in wood. II.] *J. Jap. Wood Res. Soc.* 2 (3), 1956 (104–7). 4 refs. [Jap.e.e.] P.R.

A *Cinnamomum camphora* test-piece that collapsed badly on drying at ca. 60° C., had a very low basic density (0.30 and 0.38 g./c.c., as against ca. 0.50 for uncollapsed or slightly collapsed wood). Boiling in water restored it, but it collapsed again on drying. Collapse deformation began at ca. 80% moisture content, whereas normal shrinkage in non-collapsing wood usually sets in at ca. 20% m.c.

4738. MENON, K. D. Identification of some common defects of building timbers. *Malay. Forester* 20 (2), 1957 (89–90).

Gives a tabular key for the identification of borer and fungal attack (ambrosia beetles, longhorn beetles, subterranean termites, drywood termites, powder-post beetles, carpenter bees, marine borers, fungal decay, and sapstain).

853. Grading of Wood in the Rough

See also Nos. 4414–5, 4443, 4633–4.

4739. BONNEMANN, A. Neufassung der Holzmessanweisung (Homa). [Revision of the standard German scaling and grading rules (Homa) [of 1936].] *Forstarchiv* 27 (6), 1956 (134–8). 3 refs. [G.G.]

Proposes that scaling methods should be made uniform in the Federal German Republic and grading rules revised on the following lines. A distinction should be made between main classes and sub-classes. Main classes should be established not according to assortments indicating future use, but on the basis of species, quality, soundness and diameter. The distinction between sawtimber and fuelwood should be abolished. Main classes could be subdivided in various ways, and sub-classes could be based largely on the specifications of forest authorities of the Länder or by agreements between

buyer and seller. The quality class B, which contains the bulk of the wood produced, could be subdivided for certain species.

854. Grading of Converted Timber

See also Nos. 4648–9.

4740. Deutsche Normung für Schnittholz. [German standards for sawn timber.] *Int. Holzmarkt* 1956 (23), (5–6). [G.]

Outlines and discusses proposals for German standards for sawn softwoods, prepared by the Fachnormenausschuss Holz, Stuttgart, and covering moisture content, colour, knot size and other permissible defects, dimensions etc.

4741. New Zealand Standard: Classification and grading of New Zealand building timber (National Grading Rules). *New Zealand Standard, New Zealand Standards Institute, Wellington* No. N.Z.S.S. 169 (2nd revision) 1956. pp. 27 + 1 tbl. Price 3s. 6d.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

4742. LOCKE, E. G. Review of chemical utilization. *For. Prod. J.* (2), 1957 (61–7). 129 refs.

American developments in 1956, including patents, in increased utilization of bark and chips, pulping processes and methods, spent liquor recovery, naval stores [resin] research, wood-residue hydrolysis, and lignin chemistry are surveyed.

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 3924, 4110, 4493, 4538, 4623, 4627, 4662, 4700–1, 4731–2.

4743. STRACEY, P. D. The rational utilization of India's cellulosic raw materials with particular reference to Assam. *Indian For.* 83 (4), 1957 (253–9 + 3 photos).

4744. DADSWELL, H. E., and STEWART, R. C. McK. Chemical utilisation [of Eucalypts]. *Final Rep. World Eucalyptus Conf., Rome 1956*, 1956 (190–206). [E.]

Discusses, with supporting tables, for many species, proximate analyses of chemical properties, with sampling and testing procedures; pulping by various processes, including influence of extractives, and products; fibreboards; wood carbonization and hydrolysis; tannin, kino, oils, and rutin.

4745. Pulping of tension wood. *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (87).

Chemical pulps prepared from the tension wood of *Eucalyptus regnans* and *E. nitens* were inferior to those from normal wood of the same species, the poorest pulps being obtained from the tension wood with lowest lignin and pentosan contents. Pulps prepared by mechanical means showed an opposite trend, the quality decreasing as the lignin and pentosan contents of the tension wood approached those of normal wood.

4746. **Pulping of New Guinea timbers.** *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (87).

Pulps have been prepared from *Araucaria klinkii* by the neutral sulphate, high-yield sulphate, kraft semichemical, and cold soda processes, all but the last giving satisfactory pulps. Veneer waste from *A. klinkii* was pulped by the sulphate process, giving a high-strength pulp similar to that made from hand-made chips. Cold-soda pulps have been prepared from species of the Mangrove association and from *Eucalyptus deglupta*; one species from the Mangrove area, *Excoecaria* sp., produced a very satisfactory grade of pulp. [Cf. *F.A.* 16 Nos. 2429, 4755; 17 No. 998.]

4747. BHAT, R. V., and VIRMANI, K. C. **Newsprint from Blue Gum (*Eucalyptus globulus* Labill.) and Wattle wood (*Acacia decurrens* Willd.).** *Indian For.* 83 (5), 1957 (327-38 + 2 sample sheets). 2 refs.

Experiments in the preparation of mechanical pulps from *E. globulus* and *A. decurrens* under various conditions of grinding are described. Newsprint was prepared on a pilot-plant paper machine from (1) a furnish containing 76% *E. globulus* mechanical pulp (bleached), and 24% Bamboo sulphate pulp (bleached), (2) a mixture of 75% *A. decurrens* mechanical pulp (bleached) and 25% Bamboo sulphate pulp (bleached). Samples of both are appended. [Cf. *F.A.* 18 Nos. 2266-7.]

4748. [The importance of moisture content of the wood for groundwood pulp quality.] *Beretrn. Papirind. ForsknInst., Oslo* 1956, 1957 (15-7). [Nor.]

Wood with high moisture content (46%) gave groundwood pulp having a high proportion of long fibres and consequently increased strength. Green wood showed a similar but rather less marked tendency, and the pulp and paper produced were whiter than normal; drum-barking of green wood proved difficult. Grinding 10- to 20-year-old logs, sunk in floating, with 60-70% m.c. gave pulp with normal fibre length and strength but rather low whiteness. Tests showed that wood lying above the surface of the water in bundles or rafts dried to 15-20% m.c. during the first summer. Logs lying with one end above and the other below water showed a sharp transition from high to low m.c. above the water. M.c. of wood 5-8 m. long, top and butt diameters ca. 10 and 18 cm. respectively, stored under water, increased in one month from 16 to 40%; m.c. at 2 cm. from the surface was over 50%, but in the heartwood was very little increased by underwater storage.

4749. COCHRANE, J. A. **The use of sodium sulphite at the grinder showers in the groundwood process.** *Pulp Paper Mag. Can.* 57 (3), 1956 (201-7, 215). 11 refs.

A process for reducing the energy required to produce groundwood pulp and for brightening groundwood, was developed by the Powell River Co., and has been in successful operation in the company's mills for 2½ years. Na_2SO_3 at 0.8% of the dry weight of screened groundwood pulp, is added to the grinder showers, and its presence in the

grinding zone has given a reduction in energy requirements of 8.7% and an increase of 2.5 points G.E. in groundwood brightness. The concentrated Na_2SO_3 is manufactured from commercial soda ash in a Pease-Anthony cyclonic scrubber which removes the SO_2 from the waste gas exhausted from the sulphite mill Jensen towers. The removal of the exhaust SO_2 has almost entirely eliminated atmospheric pollution in areas adjacent to the mill. The treatment has no effect on pulp strength or yield. A description is given of the experimental work leading to mill-scale application of the process. *From author's summary.*

4750. HANSEL, E. **Wesentliche Erhöhung der Holzausbeute durch das neue ALB-Semicell-Verfahren. [Substantial increase in pulp yields by the new ALB-Semicell process.]** *Holz-Kurier, Wien* 12 (22), 1957 (5). [G.]

Describes the opening of a pulp mill in Hollenstein, Lower Austria, designed for a new semichemical process in which the wood is impregnated with Na_2SO_3 before grinding. This process is said to reduce considerably the proportion of shortened fibres in the product, which is light in colour. Yield is stated to be > 80% of the dry woody substance, equivalent to a saving, compared with sulphite pulping, of 1.75 cu.m. of Spruce pulpwood per ton of pulp. It is claimed that the process is applicable to hardwoods, industrial residues, and to very young trees. The impregnant may be used repeatedly until it is all absorbed in the treated wood, so there is no disposal problem.

4751. HUSBAND, R. M. **Semichemical pulping of hardwoods with Na_2SO_3 and NaHSO_3 .** III. *Tappi* 40 (6), 1957 (412-9). 7 refs. P.R.

[Cf. *F.A.* 17 No. 2214.] Semichemical pulps obtained with NaHSO_3 are not obviously weaker than those obtained with Na_2SO_3 . Good-quality NaHSO_3 pulps at 70% yield are shown to be obtainable from *Betula papyrifera* wood digested at 180° C. for ca. 15 minutes. *From author's summary.*

4752. CARVALHO, J. DA SILVA. **A celulose de *Quercus suber* L. e a sua purificação para ester e eterificação. [Pulp from Cork Oak and its purification for the preparation of cellulose esters and ethers.]** *Publ. Serv. flor. açúic. Portugal* 20 (2), 1953 (85-129 + 1 tbl.). 32 refs. [Port.port.e.]

The experiments reported show that semichemical alkali pulps from wood of Cork Oak have strengths comparable to that of other hardwoods used in papermaking, excellent bleaching properties, and good possibilities for use in the preparation of viscose and other cellulose esters and ethers. [Cf. *F.A.* 13 No. 4214.] *From author's summary.*

4753. LUNER, P. **The effect of pre-treatments on diffusion through wood.** *Pulp Paper Mag. Can.* 57 (3), 1956 (216-20, 223). 18 refs.

Studies were made on diffusion through Spruce-wood disks cut in the various structural directions, using a modified Northrop cell. It was found that steaming and 'purging' [cf. *F.A.* 15 Nos. 909-16] increased the diffusion rates by factor of ca. 2.2, depending on the conditions of temperature and

time. This increase, for which several explanations are presented, was observed only in the radial and tangential directions. No significant variation was found in the diffusion rates between steaming and purging methods at equivalent times and temperatures. It is believed that pre-treatments of the type employed in these experiments would facilitate chemical pulping. *From author's summary.*

4754. **Mechanism of delignification.** *Rep. Commonwealth sci. industr. Res. Organ. Aust. 1955/56, 1956 (87).*

Investigations of the mechanism of alkali pulping under conditions of constant temperature and sustained alkali concentration during cooking have been completed. The rate of change in yield and the rates of lignin and pentosan removal could not be fitted to a rate equation of an integral order. Temperature had the greatest influence on delignification, pentosan removal, and cellulose loss. At any given temperature, delignification was controlled mainly by the concentration of the cooking liquor, while the pentosan removal was governed mainly by the amount of alkali used, regardless of time, concentration, and flow rate. The cellulose loss was almost independent of everything but time.

4755. CORREIA, C. A. DA PAIXÃO. Contribuição para o estudo do castanheiro em talhadia com o fim de mostrar as possibilidades na obtenção de celulose e taninos. [*Coppice Chestnut as a possible source of pulp and tannin.*] *Publ. Serv. flor. aquíc. Portugal 20 (2), 1953 (159-72 + 1 plate).* 9 refs. [Port.e.]

Tests with young coppice shoots of *Castanea sativa* showed that the wood is easily pulped by the soda process and is readily bleachable. In spite of the shortness of the fibres, paper suitable for ordinary grades of writing and printing paper was produced. Tannin content of the bark averaged 16-14%, and that of the wood 8-92%. *From author's summary.*

4756. ISTAS, J. R., RAEKELBOOM, E. L., and HEREMANS, R. Étude biométrique, chimique, et papetière de quelques bois. [*Biometric, chemical and paper-making characters of some timbers.*] *Publ. Inst. nat. Étude agron. Congo belge (Sér. sci.) No. 51, 1956, pp. 58. 76 refs. [F.]*

[Cf. F.A. 16 No. 3559.] Presents in similar detail and form, analyses, fibre dimensions, conditions of sulphate cooks used, and the chemical and physical characters of the pulps made from *Pinus radiata*, *Cupressus lusitanica*, *C. benthamii*, *C. macrocarpa*, *C. arizonica*, *Podocarpus usambarensis*, *Pinus occidentalis*, and *P. canariensis*. All except the last appear suitable for kraft pulps, the bleached pulp being inferior to good Scots Pine kraft in tearing strength but excellent in folding and bursting resistance. The first two are of special interest, the others being low yielders (46%). Similar tests of 12 broadleaved exotics, also from the Congo, show 6 Eucalypts and *Acrocarpus fraxinifolia* to be suitable for the production of 2nd-class kraft pulps.

4757. PALCZEWSKI, T., and RUTKOWSKI, J. Sulphite pulps for rayon and paper from Beech. *Prace*

Instytutu Celulozowo-Papierniczego, Poland 5, 1956 (1-16). [Pol.] *From abstr. in Chem. Abstr. 50 (22), 1956 (17439).* P.R.

Presents the results of comparative cooks of Spruce and Beech. Beech was found to be suitable for the manufacture of absorbent papers and as a blend for printing-paper furnishes.

4758. KERR, W. D., and HART, J. S. High yield sulphite pulping. Part 8. Poplar—Part II. *Pulp Paper Mag. Can. 58 (4), 1957 (139-45).* 4 refs.

Na-base acids (3% SO₃) at pH 3-6, used at 140, 170 and 190° C., gave bright, easily bleached pulps of good strength. Quality differences between high-yield sulphite pulp and neutral sulphite pulp virtually disappeared when they were compared as components of a 35% bleached Spruce pulp mixture. Rapid-cycle pulping of Poplar and various Spruce/Poplar mixtures gave excellent pulps with slight loss of carbohydrates.

4759. CARVALHO, J. DA SILVA. Alguns ensaios para o aproveitamento em celulose dum material fibroso (*Adansonia digitata* L.). [*Tests of the suitability for pulping of a fibrous material (A. digitata?).*] *Publ. Serv. flor. aquíc. Portugal 20 (2), 1953 (173-96).* 8 refs. [Port.port.e.]

Presents data on the anatomical, chemical, and pulping characteristics of 'Baobab' bast fibres (identified as *Adansonia digitata*). Pulps obtained with Na₂SO₃ were stronger and more easily bleached than those obtained with HNO₃, and are suitable for the manufacture of fine paper. [Cf. F.A. 13 No. 3455.] *From author's summary.*

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 4611, 4717, 4744.

4760. BUCHANAN, W. Wood particle products; processing information and economic data. *Timber of Canada 18 (4), 1957 (34-43, 55).*

Covers manufacturing methods, plant investment, production costs, typical procedures, adhesive, press-charging, production variables, and market requirements.

4761. MCGEE, L. B., MCLEAN, R. A., and CARLYLE, A. A. Properties of particle board related to its use in furniture manufacture. *For. Prod. J. 7 (3), 1957 (91-5).* 7 refs.

A paper based on work by the industrial experimental programme team of North Carolina State College, which has also issued a handbook on the subject. In density, bending and tensile strength, screw-holding capacity, machinability, and ease of veneering, particle board is generally inferior to solid lumber core stock, but superior in hardness, dimensional stability, thermal conductivity and freedom from defects. Some of the problems inherent in the fact that lower-density boards, desirable for several reasons (e.g. dimensional stability and ease of veneering), are weaker in screw-holding capacity and some strength properties, are discussed and some recommendations for screwing and machining made.

4762. MAKU, T., SASAKI, H., and HAMADA, R. [Mechanical properties of chipboard made of flat flake particles.] *J. Jap. Wood Res. Soc.* 2 (4), 1956 (142-5). 2 refs. [Jap.e.e.] P.R.

Chipboards were prepared from *Chamaecyparis obtusa* chips (flakes) 0.2, 0.5 or 1.0 mm. thick, 1.2 cm. wide, and 5 or 1.3 cm. long. The tensile and compression strength, and the modulus of elasticity of the boards were found to vary linearly with their density, the chip dimensions having no effect on these properties. Shear strength, however, was markedly influenced by chip thickness. Although the moduli of elasticity in tension and compression were nearly equal, tensile strength appeared to be less than compressive strength.

4763. MAKU, T., and SASAKI, H. [Effect of paraffin emulsion on the hygroscopic, swelling and mechanical properties of chipboard.] *J. Jap. Wood Res. Soc.* 2 (3), 1956 (130-2). 1 ref. [Jap.e.e.] P.R.

Wood chips $2-3 \times 0.4 \times 0.015$ cm. were mixed with 8% urea resin and hot-pressed to yield boards of 0.76-0.78 g./c.c. density. The swelling properties of the boards were remarkably improved by the addition of as little as 0.2-0.3% by weight of paraffin emulsion, but their hygroscopic properties were not improved. The method of preparing the paraffin emulsion (cationic, anionic and non-ionic surfactant) had no effect on swelling properties. The mechanical properties (bending strength and modulus of elasticity) were not affected.

4764. KRŽIŽ, E. O příčinách samovznícení dřevovláknitých desek při tvrzení. [Causes of self-ignition of fibreboards on curing.] *Dřevo* 12 (1), 1957 (4-5). [Cz.] P.R.

The author's tests show that: (1) The self-ignition points of fibreboards [species not indicated] without tempering oil (but with some paraffin wax), and with anhydrous castor oil, linseed oil and boiled linseed oil, are 192.5, 190, 216 and 217.5°C., respectively. (2) In a pile of fibreboards impregnated with anhydrous castor oil and placed in a drying oven at 145°, the temperature at the middle of the pile rose to 165° after nearly 5 hours. (3) When dry, fine wood-fibres were impregnated with anhydrous castor oil and shaped, without pressure, into a pear-shaped body, the temperature at the centre of this body rose to 200-220° within ca. 30 min. for an outside temperature of 120-155°. (4) When the outside temperature in the latter experiment was lowered (at an average rate of 1°/min.) from an initial value (5 min. after the start of the experiment) of 120°, the inside temperature reached ca. 220° after 30 min. The author concludes that uncompressed lignocellulosic fibres, when impregnated with drying oils, react more easily with O and are more sensitive to temperature than the same fibres when well compressed to form hardboards. Thus the causes of fires in hardboard plants can be explained by (a) insufficient compression (e.g. at edges and corners), (b) wood dust, and (c) the use of drying oils.

4765. KITAHARA, K., and FUKUHARA, Y. [The effect in the heat treatment of fibreboard (I).] *J. Jap. For. Soc.* 38 (5), 1956 (187-91). 1 ref. [Jap.jap.e.e.]

In impact and static bending tests: (1) absorbed energy in impact bending decreased with increasing treating temperature; (2) strength decreased at 200°C.; (3) values of Young's modulus and the modulus of rupture in bending were highest for treatment at 175°, for 2 of the 3 types of board tested; and (4) Young's modulus and the modulus of rupture in bending, but not the absorbed energy in impact bending, tended to decrease with increasing m.c. of the board before heat treatment. *From authors' summary.*

4766. CURRIER, R. A. Effect of cyclic humidification on dimensional stability of commercial hardboards. *For. Prod. J.* 7 (3), 1957 (95-100).

Samples (3×12 in.) from 14 types of $\frac{1}{8}$ - and $\frac{1}{4}$ -in. standard hardboards were subjected to 12 cycles of 30-90-30% humidity (at 100°-80°-100°F.). In successive cycles, the moisture added in the humid phase remained about the same, the moisture remaining in the dry phase decreased, thickness at any given phase of the cycle increased, and length (except for 2 boards) decreased. In general, changes were less for $\frac{1}{4}$ - than for $\frac{1}{8}$ -in. boards.

4767. McDONNELL, L. F. An evaluation of flame-resistant fiber insulation board. *Tappi* 40 (6), 1957 (207A-210A). 7 refs. P.R.

Describes two test procedures commonly used for evaluating the flame resistance of insulation boards. These evaluations are necessarily subjective. A series of tests is described in which some of the resistance factors were evaluated. The joint design of insulation-board tiles was shown to be of major importance in the flame resistance of the product.

863. Wood Hydrolysis. Saccharification

See No. 4744.

865. Plastics

4768. Make paper roll plugs from hardwood flooring waste. *Wood, Chicago* 61 (10), 1956 (24). P.R.

Machine waste is broken down to sawdust-size particles which are mixed with glue, moulded under pressure and 'cured' for ca. 12 minutes at 300°F. The product is said to be superior to conventional plugs because of uniform size, better strength properties and stability in storage.

866. Utilization of Wood Extractives

See Nos. 4744, 4755.

867. Destructive Distillation

4769. LANE, P. H. Design of a cinder-concrete block charcoal kiln. *Tech. Note Lake St. For. Exp. Sta.* No. 494, 1957. pp. 2. 1 ref.

The kiln, designed for domestic use, has an inner wall of cinder/concrete block and an exterior wall of corrugated sheet metal. The intervening 6-in. cavity is filled with dry sand.

4770. OPAČIĆ, I. Istraživanja suhe destilacije pajasena (*Ailanthus glandulosa* D.). [Investigations

on the destructive distillation of *A. altissima*.] *Sum. List* 80 (9/10), 1956 (300-13). 32 refs. [Croat. Croat.]

Compared with Beech (*A*) and Hornbeam (*B*) the wood of *A. altissima* gives a charcoal yield that is lower than *A* but higher than *B*. The yield of acetic acid is the same as for *A*, but less than *B*. Its charcoal has a calorific value equal to that of *A*. Wood of 15-20% m.c. and ≤ 5 cm. in diameter should be used.

89. Other ('Minor') Forest Products

892. Vegetable Products

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 4497, 4744, 4755, 4759, 4788-90.

4771. MARIAN, J. E., and WISSING, A. The utilization of bark. Part I. Bark literature. *Svensk PappTidn.* 59 (21-23), 1956 (751-8; 800-5; 836-7); 60 (2-5; 7; 9), 1957 (45-9; 85-7; 124-7; 170-4; 255-8; 348-52). [E.] P.R.

Lists titles drawn from *Chem. Abstr.* 1937-55, *F.A.* 1946/47-55 and *Chem. Zbl.* 1939-45, covering world literature on the utilization of waste bark. Contains the following sections: Bark properties (anatomy, chemistry); Bark quantities (amount available, thickness, volume etc.); Mechanical barking (general reviews, cutting methods, friction methods, hydraulic methods); Chemical barking; Separation of bark from wood chips; Storage; General reviews of utilization; Utilization as fuel (drying, briquetting bark and wood waste, burning bark and wood waste); Pyrolysis; Bark and wood waste as soil improvers; Use in adhesives and moulded products; Miscellaneous uses of whole bark; Utilization of bark fibres (insulation; hard-board and insulating board, paper and cardboard, cellulose; textile fibres; miscellaneous); Constitution and properties of tanning extracts (chemical properties; physical properties; effects on properties of other substances); Isolation of tannins in bark extracts; Utilization of tannins (tanning material from waste bark; synthetic resins; anti-oxidants; gas and oil purification; drilling muds; viscosity regulating agents; water treatment). Within the sections references are arranged alphabetically under authors' names.

4772. AARON, J. R. Conifer barks as a source of tannins for the leather industry. *Scot. For.* 11 (2), 1957 (72-6). 10 refs.

Presents and discusses results of analyses to determine tannin contents of the bark of Scots and Corsican Pine, European and Japanese Larch, Norway and Sitka Spruce, Douglas Fir and Western Hemlock. Analyses have also been made of bark and wood of Pedunculate Oak and Sweet Chestnut. It is concluded that Sitka Spruce and Japanese Larch barks are produced in large enough quantities in Great Britain and have sufficiently promising analyses to merit industrial investigation.

4773. REDDI, P. V. R. K., JOSEPH, K. A., and PADMANADHAN, K. *Kahua* [*Terminalia arjuna*]

bark in sole-leather manufacture. *Tanner, Bombay* 11 (4), 1956 (21-2). From *abstr.* in *Chem. Abstr.* 51 (2), 1957 (1636). P.R.

A 50/50 blend of Kahua bark and myrobalans produced satisfactory sole leather. The air-dry bark contains ca. 20% of a mixture of hydrolysable and condensed tannins and 10% soluble non-tannin, and has a pH of 5.0.

4774. JENSEN, W., IHALO, P., and VARSA, K. Studies on suberin. VIII. Separation of the acids of suberin by means of countercurrent distribution of their methyl esters. *Pap. ja Puu* 39 (4), 1957 (237-42). 18 refs. [E.e.] P.R.

[Cf. *F.A.* 16 No. 2488.] The methyl esters of suberin from *Quercus suber* and *Betula verrucosa* have been separated, and the composition of Birch and cork suberins calculated from the theoretical distribution curves. From authors' summary.

4775. JENSEN, W., and TINNIS, W. Studies on suberin. IX. Identification of unsaturated acids in suberin of *Quercus suber* and *Betula verrucosa*. *Pap. ja Puu* 39 (5), 1957 (261-4). 14 refs. [E.e.] P.R. [Cf. *F.A.* 16 No. 2488.]

4776. HERGERT, H. L. The flavonoids of Lodgepole Pine bark. *J. organ. Chem.* 21 (5), 1956 (534-7). 27 refs. LD.U.

The principal flavonoid present is myricetin. Small amounts of quercetin, dihydromyricetin, dihydroquercetin, aromadendrin, and pinobanksin are also present. From author's summary.

4777. GREGORY, A. S. et al. Douglas-Fir bark as a source of quercetin. *For. Prod. J.* 7 (4), 1957 (135-40). 18 refs.

Describes a cheap oxidation process for converting dihydroquercetin, present in the water extract of bark, to quercetin.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also Nos. 4744, 4793.

4778. *Duboisia myoporoides*. *Rep. Commonw. sci. industr. Res. Organ. Aust.* 1955/56, 1956 (31).

Two alkaloids, not hitherto recorded for this species, have been found in a sample of *D. myoporoides* from S. Queensland. One of them, pelletierine, is the active principle in Pomegranate bark, which has been used since ancient times as a taenicide, and its occurrence in this geographical variety of *D. myoporoides* may be of economic importance.

4779. WATSON, T. R., and WRIGHT, S. E. The cardiac glycosides of *Gomphocarpus fruticosus* R. Br. I. Afroside. II. Gomphoside. *Aust. J. Chem.* 9 (4), 1956 (497-511); 10 (1), 1957 (79-84). 37 refs. O.R.S.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also section 284 and Nos. 4742, 4744.

4780. BARDYŠEV, I. I., and ČERČES, H. Preparation and properties of colophony [rosin] from the

rosin [resin] of common Larch. *Vesci Akademii Navuk Belaruskai S.S.R., Ser.fiz.-teh. Navuk* 1956 (2), (141-5). [Russ?]. From *abstr. in Chem. Abstr.* 51 (5), 1957 (4021). P.R.

The resin yield from tapped *Larix decidua* trees was 500-1000 g./tree during the period May-September. The resin contained 12-5% turpentine. Two methods of preparing rosin are described, each giving a yield of ca. 75%. The chemical and physico-chemical characteristics of Larch rosin are indicated: it differs from Scots Pine rosin in its lower acid value (147-149 vs. 150-166), and higher unsaponifiable fraction (17.2-18.2 vs. 7.5-10.5%).

4781. MURAŠKINA, A. P. Sposob polučeniya elovogo balzama dlja izgotovleniya gistologičeskikh preparatov i drugih analogičnyh celei. [Method of obtaining Spruce balsam for making histological preparations and for other similar purposes.] *Bjulleten' Izobretenii [U.S.S.R.]* 1956 (2), (20). [Russ.] From *abstr. in Gidrol. lesohim. Prom.* 9 (8), 1956 (unpublished insert). [Russ.] P.R.

USSR Patent No. 102,568 of 12.5.1952. Spruce resin is extracted at 20° C. with a 3- to 4-fold volume of benzine, filtered, evaporated at 100°, and the residue dissolved in xylene, benzene or toluene.

4782. KAHILA, S. K. The composition of the gum oleoresin acid of *Picea excelsa*. *Pap. ja Puu* 39 (1), 1957 (7-8). 3 refs. [E.e.] P.R.

The oleoresin proved to contain ca. 70% resin acids, the remainder being mainly unsaponifiable neutral matter. The resin acids were analysed and compared with those found in *Pinus palustris* [see *F.A.* 10 No. 2867].

4783. MIYAZAKI, M., and YASUE, M. Studies on natural resins. I. Isolation of palustric acid from the oleoresin of *Pinus densiflora*. *J. Jap. Wood Res. Soc.* 2 (5), 1956 (210-2). 3 refs. [E.jap.]

4784. HUŞ, S. Fıstık çamı terebantininin kimyasal özellikleri hakkında mutemim bilgilere. [Some supplementary data from the study of turpentine of *Pinus pinea*.] *Istanbul Üniv. Orm. Fak. Derg.* 5A (1/2), 1955 (73-6). 1 ref. [Turk.g.]

Lists the physical properties of balsam from *Pinus pinea* and of crystals of resin acids derived by recrystallization with acetone.

4785. HAMPTON, B. L. A new primary resin acid from *Pinus caribaea*. *Journal of Organic Chemistry, Easton, Pa.* 21 (8), 1956 (918-20). 3 refs. O.R.S.

Caribic acid was found in resin of *P. caribaea* but not in that of *P. palustris*. The quantity present (ca. 3%) is sufficient to retard the crystallizing tendency of the resin.

4786. SANDERMANN, W., and STOCKMANN, H. Untersuchungen über die Biogenese der Koniferen-Harzsäuren. [Studies of the biogenesis of conifer resin acids.] *Naturwissenschaften* 43 (24), 1956 (581-2). 4 refs. [G.] O.R.S.

A preliminary report on experiments made on the isopropyl group of resin acids in *Pinus sylvestris*.

4787. NAKATSUKA, T., and HIROSE, Y. Composition of the essential oil from leaves of 'Nezuko'

(*Thuja standishii* Carr.). *J. Jap. For. Soc.* 37 (11), 1955 (496-8). 5 refs. [E.e.jap.]

Leaves of *T. standishii* yielded, on steam distillation, 0-73% of essential oil. Fractional distillation yielded α -pinene, camphene, *l*-fenchone, *l*-borneol, bornyl acetate and sesquiterpene alcohol, but no thujone.

4788. FUKUSHI, S. [Studies on the bark-oil of Larch (Part I.).] *Transactions of the Tottori Society of Agricultural Science, Tottori* 10 (4), 1955 (26-9). 6 refs. [Jap.e.] C.G.B.

Summarizes results of investigations of the volatile constituents of the barks of (1) *Larix leptolepis* and (2) *L. dahurica* var. *japonica*. The essential oil of (1) contained 5% of fatty acids, consisting mainly of stearic acid and a small amount of capric acid. The acidic fraction of (2) contained caprylic acid and lauric acid. From author's summary.

4789. LAHEY, F. N., and LAMBERTON, J. A. The occurrence of ledol in [bark of] *Phebalium squameus* Labill. *Aust. J. Chem.* 9 (3), 1956 (431-3). 10 refs. O.R.S.

4790. BIRCH, A. J., and MOSTYN, K. M. C. A new sesquiterpene alcohol from [bark of] *Himantandra baccata* Bail. *Aust. J. Chem.* 8 (4), 1955 (550-1). 3 refs. O.R.S.

4791. SARKAR, S., and CHAKRABARTY, M. M. The chemical examination of the seed fats from *Bischofia javanica* Blume and *Antidesma diandra* Roth. *Sci. & Cult.* 22 (6), 1956 (336-7). 4 refs. E.M.B.

The oil contents of these seeds are 21.4 and 10.2% respectively. The physical properties of these oils and the composition of the mixed fatty acids they contain (spectrophotometric assay) are tabulated.

4792. SAID, M. Seeds of *Olea cuspidata* (Kao). *Pakistan J. For.* 7 (1), 1957 (58).

Gives results of an analysis of the oil from this wild Olive, which much resembles commercial olive oil.

4793. DAW KYIN YEE. Report on chaulmoogra oil. Project No. R.—I.29. *Burmese For.* 6 (1), 1956 (120-3).

Gives data on yield and properties of *Hydnocarpus* (*Taraktozenos*) *kurzii* seed oil, employed in the treatment of leprosy.

4794. RAO, P. S., and SHARMA, R. K. Studies on Indian plant gums: composition and graded hydrolysis of gum karaya (*Sterculia urens* Roxb.). *Proc. Indian Acad. Sci.* 45A (1), 1957 (24-9). 19 refs. O.R.S.

4795. KALANTYRJI, M. S. Nakoplenie gutty u evkomii v različnyh geografičeskikh zonah. [The gutta-percha content of *Eucommia ulmoides* in different geographic zones.] *Agrobiologija* 1956 (4), (115-9). [Russ.] I.M.I.

[Cf. *F.A.* 16 No. 1607.] A comparison was made of the gutta-percha content of leaves and some other parts of *E. ulmoides* in the Soviet moist subtropics; the content in 7-year and 20-year stands grown in

Abkhazia was similar to that in the native habitat (Szechwan). Analyses were also made of leaves from 5 ecotypes (plants > 5 years old) introduced into various regions from Krasnodar to Tadzhikistan. Results showed that the % of gutta was higher in the drier regions, but growth was slower, fewer laticiferous elements were formed, and total gutta content was lower than in moister regions. No significant difference was observed between the 5 ecotypes.

4796. VOINEA, F., and COCALCU, T. Contribuții la cunoașterea conținutului de gutapercă din salbe (*Euonymus europaea* L. și *Euonymus verrucosa* Scop.). [Gutta content of *E. europaeus* and *E. verrucosus*.] *Rev. Pădurilor* 71 (7), 1956 (456-60). 9 refs. [Rum.]

Presents and discusses tabulated data on (1) gutta-percha content of cultivated plants growing at different densities and at different stages of development; (2) content in plants of different dimensions growing in the forest; (3) weight of roots and of aerial parts of cultivated plants; (4) ditto for plants growing (a) in the open and (b) under forest cover.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also Nos. 4791-3.

4797. RAMADAN, D. A note on the nutritive value of *Acacia cyanophylla* seeds. *Emp. J. exp. Agric.* 25 (97), 1957 (37-9). 2 refs. O.R.E.

The crude protein content of the seeds was found to be ca. 30%. They contained no cyanogenic glucosides, and their potential value as feeding stuff in Cyprus is considered high. In feeding tests with chicks, the gross protein value was about equal to that of groundnut meal.

4798. RISPOLI, E. Sfruttamento industriale dell'*Ampelodesma mauritanica* e possibilità di sviluppo con sistema cooperativistico. [Industrial utilization of *A. mauritanica* and the possibility of developing it co-operatively.] *Monti e Boschi* 8 (5), 1957 (220-8). [It.f.e.]

The grass grows abundantly under *Pinus halepensis* and on cut-over areas in S. Italy, and is used on a small scale for rope-making. The possibility of developing this manufacture is discussed.

892.8. Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

4799. MCCLURE, F. A. Bamboo in the economy of oriental peoples. *Econ. Bot.* 10 (4), 1956 (335-61). 29 refs.

A popular account naming species used in paper-making, textiles, basketry, matting, rope, house construction, furniture, bridges, fishing equipment etc., written from the Plant Introduction Section, U.S.D.A.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

4800. GILL, C. B. Manitoba looks northward for forest development. *Pulp Paper Mag. Can.* 58 (4), 1957 (110-7).

Tabulates the land classification, annual cut 1954-56, and softwood and hardwood volumes from the provincial inventory completed in 1956. Past and proposed development in the north, in large-scale nickel mining, rail facilities and forestry, are discussed and the opportunities for pulp production (including sites for installations, power supplies and river driving) reviewed. Species available, state of regeneration, control of exploitation, and progress in working plans are also outlined.

902. History of Forests and Forestry

See also Nos. 3816-25.

4801. MANTEL, K., and BOTTER, R. Aus der Forstgeschichte. I. Waldgeschichte und Forstgeschichte einzelner Reviere. [History of forestry. I. The history of forests and forestry in individual districts [in Germany].] *Forstarchiv* 28 (3), 1957 (49-53). 57 refs. [G.]

Reviews the literature on this subject.

4802. GEORLETTE, R. Abrégé de l'histoire des forêts françaises depuis la promulgation de l'ordonnance de 1669 jusqu'à la veille de la Révolution.

[An epitome of the history of French forests from the promulgation of the ordinance of 1669 to the eve of the Revolution.] *Rev. for. franç.* 9 (5), 1957 (403-18). 65 refs. [F.]

4803. [Forest developments in Hungary 1945-55.] *Erdő* 4 (4), 1957 (145-88). [Hu.]

Contains 10 articles covering management, silviculture, utilization, roads and buildings, forest schools, research, progress in productivity and the calculation of forest wages.

4804. VALENČIČ, V. Nekdanji deželnoknežji gozdovi na Primorskem. [The ancient princely forests of the Slovenian littoral.] *Gozd. Vestn.* 14 (8), 1956 (233-51). 85 refs. [Sloven.]

Outlines the history of the forests of the Slovenian Karst and of the former provinces of Istria and Gorizia since 1500.

4805. BRICE, W. C. Turkiyede ormancılığın tarihi. [The history of forestry in Turkey.] *İstanbul Üniv. Orm. Fak. Derg.* 5A (1/2), 1955 (19-38). 20 refs. [Turk.E.]

Anatolia, a refuge for pre-glacial forest species of Europe, has become drier since the glacial period. Ancient literature and present evidence are adduced to show that its deforestation is due rather to its exploitation by Greece, Rome, and Byzantium for exports of wheat, horses, wine, wool, minerals, and

and ships timber. An economy of cities, large estates, and roads, resulting in deforestation, over-grazing and excessive cultivation, silted harbours and increasing coastal swamps, supplanted a village economy, originating in Neolithic times and later controlled by a priesthood that probably understood the interdependence of agriculture, forestry and water supplies (terraced fields). The Turkish invasion broke up the planned exploitation and revived the village economy, since which the forests have been better protected than for the previous 1500 years.

4806. **Service Centenary issue.** *Burmese For.* 6 (1), 1956. pp. 144 + 140. [E.Burmese.]

Includes a number of articles reviewing the progress in forestry during the past 100 years, by H. R. Blanford, U. Kyaw, U. Thein Lwin, C. W. D. Kermode, U. Tan Chein Hoe, U. Hman, A. Long, U. Tin Htut, U. Kwet Kaw, U. Tin Kyaw, U. Pe Kin, U. Win Mg, E. A. P. Reynolds.

903. Forest Policy, General

See also No. 4800.

4807. **White Paper No. 85 of 1957. A forest policy for Kenya.** Government Printer, Nairobi. 1957. pp. 9. Price 1s.

Resolutions cover reservation, protection, management, industry, finance, employment, African areas, private and other forests, public amenity and wild life, research and education.

4808. **Forest policy and legislation.** *Rep. Dep. agric. vet. Serv. Somaliland Prot.* 1956 (20-2 + 1 map).

Includes a draft forest policy prepared for the 1957 Commonwealth conference with lists of reserves fully constituted and another list of those awaiting the completion of details. A map shows reserved areas.

4809. SEWANDONO. Kewadajiban kehutanan terhadap perkembangan industri. [The task of forestry in relation to industrial development.] *Rimba Indonesia* 5 (9/12), 1956 (473-84). [Jav.Du.jav.du.e.]

Discusses recent developments in wood preservation and laminated construction and concludes that, since they are likely to lead to a smaller demand for Teak, the Teak area in Java could be reduced and timber output increased by planting fast-growing species. Outside Java, attempts should be made to improve the Dipterocarp forests and increase forests of *Agathis* and other valuable species, for export. [Cf. *F.A.* 18 No. 4106.]

904. General Regional Accounts of Forests and Forestry

4810. BACKHOUSE, G. W. Thetford Chase, Swaffham, and King's Forests, further notes. *Forestry* 30 (1), 1957 (57-68). 8 refs.

Continues the history of these East Anglian Pine forests from the point reached by J. Macdonald in 1938 [see *F.A.* 1 p. 124]. After describing the effect of the war on the area, it deals shortly with climate, present planting methods, thinning and production, utilization, protection, and organization. *Author's summary.*

4811. RUBNER, K. Die Grundlagen unserer Forstwirtschaft. I. Die Hauptgebiete der Deutschen Bundesrepublik und ihre ursprüngliche Bestockung. II. Die heutigen forstlichen Verhältnisse der Bundesrepublik. [The basis of our forestry. I. The chief forest regions of the German Federal Republic and their original stocking. II. The present state of forestry.] *Holz-Zbl.* 83 (39; 42), 1957 (533-6; 573-8). [G.]

Distinguishes and describes 21 forest regions and gives statistical data for federal states, including the Saar, on forest areas, species distribution, age classes, yields, afforestation etc., based on postwar surveys.

4812. SEABRA, L. DE, FERREIRINHA, M. P., and FREITAS, M. C. P. G. DE. Notícia sobre a actividade florestal na Índia Portuguesa. [Notes on forestry in Goa.] *Garcia de Orta, Lisboa Spec. No.*, 1956 (111-5 + 6 plates). [Port.f.e.] A.P.B.

Forests cover ca. 159,924 ha. of the total surface area of 3983 sq. km. Notes are presented on the aims of the administration with regard to the forests and on some of the more important tree species and their uses.

4813. HUECK, K. Waldgeographische Gliederung des brasilianischen Amazonasbeckens. [Geographical division of the forests of the Amazon basin.] *Forstwiss. Cbl.* 75 (11/12), 1956 (520-35). [G.]

Describes the Amazon basin by (1) ecological regions and (2) geographical regions. Ten geographical divisions are distinguished and named. Notes are also presented on the rubber, cacao, pharmaceutical products and 'timber' industries and an annotated list is presented of trees suitable for timber production.

4814. **Government of Cyprus Forest Department: Statement prepared for the British Commonwealth Forestry Conference 1957.** Conservator of Forests, Nicosia, Cyprus. 1957. pp. 21.

4815. **Statement by the Forestry Department of the Gold Coast prepared for the British Commonwealth Forestry Conference 1957.** Government Printer, Accra. 1957. pp. 26.

4816. **Statement by the Forest Authority of the Eastern Region of Nigeria for the British Commonwealth Forestry Conference 1957.** Chief Conservator of Forests, Eastern Region, Enugu, Nigeria. 1957. pp. 14.

4817. **Union of South Africa Department of Forestry: Statement prepared for the British Commonwealth Conference, 1957.** Government Printer, Pretoria. 1957. pp. 47.

4818. **British Commonwealth Forestry Conference 1957: Statement by the Conservator of Forests, Windward Islands, for the colonies of Grenada, St. Vincent, St. Lucia, Dominica.** Conservator of Forests [Dominica?] 1957. pp. 34.

4819. **Statement by the Forest Department of the British Solomon Islands Protectorate prepared for the British Commonwealth Forestry Conference 1957.** Forest Department, Honiara. 1957. pp. 7.

4820. A statement on forestry in Australia 1951–1955 prepared by Forestry and Timber Bureau for the Seventh British Commonwealth Forestry Conference 1957. Government Printer, Canberra. 1957. pp. 31.

4821. British Commonwealth Forestry Conference 1957: Statement prepared by the Director of Forests, Queensland. Government Printer, Brisbane. 1957. pp. 9.

905. Forest Statistics and Resources

See also Nos. 4189–90, 4800, 4811, 4814–21.

4822. STREYFFERT, T. Världens framtida virkesförsörjning. [World timber trends and prospects.] *Skr. K. Skogshögsk., Stockh.* No. 27, 1956. pp. 258. Many refs. [Sw.sw.e.]

Gives data in tables and graphs on: world exploitation and use of wood; trends and prospects in the use of wood and wood products; the world's forest resources; consumption and production of wood in various regions (Europe, N. America, U.S.S.R., and other regions); production of wood products and trade, and the position of Scandinavia.

4823. HANDEL-MAZZETTI, P. Die bisher bekannt gegebenen Ergebnisse der Waldstandsaufnahme und die Holz verarbeitenden Industrien in Österreich. [Available data on the forest survey and the wood-working industries in Austria.] *Int. Holzmarkt* 1956 (14), (7–8). [G.]

[Cf. F.A. 18 No. 1177.] Cites figures showing the discrepancy between requirements and fellings, and discusses methods of obtaining a balance between amounts available and requirements, e.g. by greater rationalization in sawmilling and by reducing fuel-wood requirements.

4824. PERKUČIN, I. Statistika šumarskog fonda i neki predlozi za njeno poboljšanje. [Statistics of forest resources and suggestions for improvement [in their compilation].] *Šumarstvo* 9 (4/5), 1956 (232–45). [Serb.e.f.]

The forest resources of Vojvodina in 1952 are shown in tabular form by area, age-class, ownership-class, species and volume. Improved methods of collecting data are suggested.

4825. ARMSTRONG, G. R., and BJORKBOM, J. C. The timber resources of New York [State]. North-eastern Forest Experiment Station, Upper Darby, Pa. 1956. pp. 37 + 1 map. 14 refs.

Presents the result of the first comprehensive ground and aerial survey made from 1949 to 1952. Tabulated data show the commercial forest land area by ownership, stand-size classes, and major forest types; the net volume of all timber on commercial forest land by class of material; the net volume of standing sawtimber, and total timber by species, ownership, stand-size class and diameter class; net annual growth, mortality and cut on commercial forest land; and output of timber products. A colour map shows the major forest types. Findings are discussed and an appendix includes a definition of terms, description of survey methods and a list of the species tallied.

907. Indirect Significance of Forests (Rural Amenities, National Parks, Forest Influences etc.)

See also section 116 and No. 4405.

4826. SABOUREAU, M. La protection de la nature en côte française des Somalis. [The protection of nature in the coastal area of French Somaliland.] *Bois For. Trop.* No. 53, 1957 (3–7). [F.]

A short account of the principal vegetation types with some general remarks on protection policy.

4827. ELDER, N. L. North Island protection forests. *N.Z. J. For.* 7 (3), 1956 (96–103). 1 ref.

The main protection forests lie in the eastern and southern half of the island. On the pumice lands west of the volcanoes, forest is not continuous and it is necessary to give consideration to tussock and scrub lands outside forest proper. Vegetation types are broadly correlated with climate and soils, and evidence is given of long-term changes operating at the present day but differing on greywacke and on pumice. Superimposed changes due to man and introduced animals are extensive and are causing a general deterioration of protective cover, but there is some evidence of the adaptation of vegetation to browsing. *Authors' summary.*

91. Land Use, Land-Use Policy (Including Afforestation Policy)

See also Nos. 3624, 3865.

4828. GOISLARD, P.-H. Les reboisements 'en timbres-poste'. ['Postage-stamp' afforestation.] *Rev. for. franc.* 9 (5), 1957 (341–50). [F.]

Discusses the economic, social, and conservation problems involved in the planting of very small areas, particularly in the mountains, under the system of subsidies granted to private owners by the Fonds Forestier National.

92. Forest Ownership and Ownership Policy

4829. ASPREMONT LYNDEN, H. D'. La politique d'achat de forêts par les pouvoirs publics. [The policy of buying forests by public authorities.] *Bull. Soc. for. Belg.* 64 (6), 1957 (257–89). [F.]

Gives data for Great Britain, Germany, the Netherlands and France, and discusses their bearing on Belgian policy.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

4830. MANTEL, K. Wald- und Forstwirtschaft in der deutschen Forstgesetzgebung und im sonstigen Agrarrecht mit vergleichenden internationalen Hinweisen insbesondere auf die finnische Forstgesetzgebung. [Forest management and silviculture in German legislation and elsewhere in the agrarian code, including comparisons with foreign, particularly Finnish, legislation.] *Forstwiss. Cbl.* 75 (11/12), 1956 (505–19). [G.]

Discusses the history and development of German forest law, the influence of different kinds of ownership on management, limitations imposed on individual action by legislation, the need for method in management, and the use of and need for trained personnel, the care of private forests through public

bodies or private societies, the relationship of management to markets, and legal aspects of forest protection.

4831. YLLA Y MORAGAS, M. Apuntes de temática forestal jurídico-administrativa. [Forest law and administration.] *Montes, Madrid* 13 (73), 1957 (35-40). 9 refs. [Span.]

Notes on the past history of Spanish forest law, with a short exposition and some criticisms of the law at present in force.

94. Other Methods to Implement Forest Policy

941. State Subsidies etc.

See No. 4828.

945.1. Advisory and Information Services, Documentation Centres

See No. 4165.

945.3. Education. Training. (Including Educational Tours

See also Nos. 4104, 4626.

4832. La dasonomía en el programa de asistencia técnica de STACA. [Forestry in the technical assistance programme of STACA.] *Agric. trop., Bogotá* 12 (7), 1956 (465-9). [Span.] A.P.B.

In 1954 forestry projects were introduced into the programme of the Servicio Técnico Agrícola Colombiano Americano (STACA) in Colombia. One of the most important achievements so far has been the setting up in Piedras Blancas of an Experiment Station and National Training Centre in Forestry. Some information is given on the past work and future programmes of this centre.

4833. SISAM, J. W. B. Forestry at the University of Toronto. *Timber of Canada* 18 (3), 1957 (36... 41).

A note on the first 50 years, just ended, covering history, equipment, instruction forests, teaching, appointments, courses studied and outturn of graduates (752 since 1909). The Ontario Forest Ranger School is supervised jointly with government.

945.4. Research

See also Nos. 3874, 4494-5, 4567, 4832.

4834. STEBBING, E. P. Forestry research in India, Great Britain, the Dominions and the colonies. *I. Emp. For. Rev.* 36 (2), 1957 (178-85).

Gives an account of the origins of forest administration in India and Burma, and of present-day research in Great Britain.

4835. [Progress reports on forest research in the Ryukyu Islands.] *Testing Report, Ryukyu Forestry Experiment Station* No. 2, 1954. pp. 76. [Jap.e.]

Contains 11 progress reports or proposals for tests, by different authors; it is emphasized that all results and conclusions are provisional. Subjects covered

include:—choice of species, in general (*G. Hokama*), and for erosion control in devastated areas (*I. Tamaki*); trials of exotics (*R. Sugana*) including *Liquidambar formosana* (*S. Maeshiro*); insect pests (*S. Kuniyoshi*); protection of seedlings of *Cryptomeria [japonica?]* against shoot disease (*G. Hokama*); and a list of the plants of Haeteruma, Yaeyama Islands (*S. Tawada*).

4836. JACKSON, J. K. Interim report to the Government of Iraq on forestry research. FAO, Rome. 1956. pp. 64 + 1 map. Limited distribution.

4837. Forest research review 1956. British Columbia Forest Service, Victoria, B.C. 1957. pp. 44.

A progress report on research by the Research Division of the B.C. Forest Service up to the end of March 1956.

4838. CURTIS, J. D. Forest management research by the Intermountain and Northern Rocky Mountain stations. A bibliography 1912 through 1954. *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 6, 1955. pp. 42.

Lists publications dealing with ecology, silviculture, growth and yield, damage and protection, and forest products.

946.2. Conferences and Excursions

See No. 4024.

95. Forest Taxation

See also Nos. 4478-80.

4839. Purchase of standing timber. *Timb. Tr. J.* 221 (4207), 1957 (69-70). 1 ref.

Discusses the House of Lords decision in *Hood Barrs v. Inland Revenue Commissioners*. The sums paid were held to be for a capital asset (a means of producing stock in trade and not the stock itself) and therefore not debitable to the trading account. Only where standing timber is purchased for current requirement and is cut down within a short time would such accounting be permissible.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries.

4840. HEIKINHEIMO, L. Metsä- ja uittotyövoima. [Labour in forestry and floating [in Finland].] *Eripainos Metsäkäsiikirjasta [Helsinki?]* [1956?] pp. 47. 22 refs. [Fi.]

Definitions, size and composition of the labour force, its use, wages, living conditions, food, accident prevention etc.

4841. HAKKARRAINEN, A. E. Hakkuumiesten metsätyöajan käyttö. [The expenditure of forest working time by loggers.] *Julk., Metsäteho, Helsinki* No. 35, 1956. pp. 128. 45 refs. [Fi.e.]

Analyses data collected in 1946-1952 on seasonal variations in length of the working day, proportion of working and non-working days, length of working week, meal breaks, and travelling distance and time.

4842. HAKKARAINEN, A. E. Hakkuumiesten metsätyöajan käyttö talvikautena 1953/54. [The expenditure of forest working time by loggers 1953-54.] *Tied., Metsäteho, Helsinki* No. 124, 1956. pp. 15. [F.i.e.]

Similar data to that for 1946-52 already published [see preceding abstract].

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also No. 3815.

4843. ROBERTSON, W. M. A note on the second three forestry conferences, Empire and Commonwealth, held in South Africa, the United Kingdom and Canada. *Emp. For. Rev.* 36 (2), 1957 (157-68).

An account of the conferences of 1935, 1947 and 1952.

4844. WHITE, G. F. [Editor]. The future of arid lands: papers and recommendations from the International Arid Lands Meetings [New Mexico, 1955]. American Association for the Advancement of Science, Washington D.C. 1956. pp. ix + 453. Many refs.

Includes papers by many authors, grouped under the heads: the broad view; variability and predictability of water supply; better uses of present resources; prospects for additional water resources;

better adaptation of plants and animals to arid conditions.

4845. World Eucalyptus Conference. Final report. Food and Agriculture Organization of the United Nations, Rome. No. FAO/56/12/8863, 1956. pp. 208. Many refs. [E.]

In addition to the report and recommendations of the Plenum and the sections:—Value of Eucalypts; Problems basic to planting; Establishment, management and protection; Protection for farms and soil stabilization; and Utilization—papers read are published in full or summary (see separate notices). Another annexe lists reports and bibliographies prepared by participating countries, obtainable only from their authors.

972. Organizations

4846. BERESFORD-PEIRSE, SIR H. The work of F.A.O. *Forestry* 30 (1), 1957 (1-8 + 1 photo).

4847. LELOUP, M. Ten years of forestry in FAO [1947-1957]. *Unasylva* 11 (2), 1957 (50-72, 77-90).

4848. RICHARDS, E. G. Forest working techniques. *Quart. J. For.* 51 (2), 1957 (147-52 + 4 plates).

Describes the work of the Joint FAO/ECE Committee on Forest Working Techniques and Training of Forest Workers.

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References: 1. *Agerpres Bulletin*, Bucharest; 2. *American Nurseryman*, Chicago; 3. *Bulletin*, Bonn; 4. *Chêne-Liège*, Constantine, Algiers; 5. *CPPA News Bulletin*, Montreal; 6. *Forests and People*, Alexandria, La.; 7. *Holz-Kurier*, Vienna; 8. *Italia Agricola*, Rome; 9. *Nature*, London; 10. *New Zealand Forest Service Newsletter*, Wellington; 11. *New Zealand Timber Journal*, Wellington; 12. *Press Releases*; 13. *Revista Forestal Argentina*, Buenos Aires; 14. *Shade Tree*, Kearney, N.J.; 15. *Soil Conservation*, Washington; 16. *Southern Lumberman*, Nashville, Tenn.; 17. *Timberman*, Portland, Ore.; 18. *Wood*, London.

International

Conferences. The Fifth World Forestry Conference is to be held in the United States in 1960. The site proposed is the State of Washington or Oregon in the Pacific North-West.

An International Conference on the problems associated with the retrieval of scientific information will be held at Washington, D.C., in Nov. 1958 under the aegis of the National Academy of Sciences, National Science Foundation, and American Documentation Institute. Emphasis will be laid upon the critical examination and appraisal of techniques, systems and organization for the storage and retrospective search of scientific information.

UNESCO. Approval was given at the UNESCO General Conference (New Delhi, 1957) for the Arid Zone Programme to become a 'Major Project'. National committees for participation in the programme have been set up in many arid-zone countries and will act in liaison with UNESCO. So far, studies have been made on hydrology, plant ecology, sources of power available in the arid zone (particularly wind power and solar energy), human and animal ecology, and arid-zone climatology. The next meeting of the Advisory Committee will be held in Karachi in Nov. 1957, and at the same time it is proposed to hold a symposium on Soil Erosion with special reference to animal and crop husbandry, to be organized jointly by UNESCO and the Government of Pakistan.

At the 8th Session of the UNESCO General Conference held in Montevideo, approval was given to the proposal that UNESCO should develop a programme of research into problems of the Humid Tropics. A preparatory meeting of specialists in this field was convened in Kandy, Ceylon, in March 1956, and was preceded by a symposium on the Study of Tropical Vegetation. The proceedings of the symposium are at present in the press and will be available shortly. The first meeting of the Advisory Committee was to be held in Brazil in July 1957.

Argentina. On the dissolution of the Comisión Económica para América Latina (CEPAL), a permanent committee, Comité Argentino de Estudios Forestales (CADEF) has been set up to supervise the implementation of the measures recommended by CEPAL. Among these are the establishment of an Argentine forest institute, the organization of forest training, and the revision of the forest law. (13; Summer 1957.)

Australia. An experiment has been made in spraying Bago State Forest, ca. 200 miles from Sydney, by a specially equipped Beaver aircraft, to stop an invasion of stick insects (*Didymuria violascens*), which feed on leaves of Eucalypts as well as their roots. Defoliated trees often die, and thousands of acres of forest have been severely damaged. For the experiment, $\frac{1}{2}$ sq. mile of infested forest was sprayed with BHC and another $\frac{1}{2}$ sq. mile with dieldrin at a rate of 1.3 gal./acre. Satisfactory kills were obtained with both insecticides, and the Beaver was able to deliver its load over the area at a height of 100 ft., with considerable accuracy (11; July 1957).

Austria. *Alnus incana* has been successfully used for pulping by the ALB-Semicell process [cf. *F.A.* 18 No. 4750]. Tests have shown good strength and bleaching properties with 84.7% yield (7; 25.7.57).

Canada. Federal financial help for forest fire protection programmes in six Canadian Provinces has been announced by the Minister of Northern Affairs and National Resources. The Federal Government is itself responsible for protecting forests in the Northwest and Yukon Territories, national parks, federal forest experiment stations, Indian reserves, and lands administered by the Department of National Defence (12; 20.7.57).

A team of 3, working for Macmillan and Bloedel in British Columbia, have salvaged as many as 140 sinkers in a day from Chemainus Harbour in the vicinity of a big sawmill. In a typical 2-hour period they also picked up 25 boom chains, 5 peavies and 3 sledgehammers. They wear constant-volume suits (surrounding the entire body with air for warmth). Air is supplied by 'Navy Doubles' (two 140-cu.-ft. tanks of compressed air, enough for a dive for 70 minutes, 33 feet down) (17; August 1957).

France. A national forest census is to be undertaken and it is hoped to make a beginning this autumn with the Gascon Landes. A combination of aerial survey with ground checks is to be used (4; 15.8.57).

In view of rumours that German and Italian pulpmills are prepared to offer higher prices for wood from the Gascon Landes than local users are paying, the Commission des Forêts de Gascogne are asking the Government to put in hand a detailed inventory of the Gascon forests, on the basis of which proper management plans can be drawn up before excessive exploitation takes place (4; 15.6.57).

Germany. The Plön Hydro-Biological Institute has announced the successful outcome of its experiments in making paper from bulrushes (*Scirpus lacustris*), which are commonly used for making mats, baskets, chair-seats, etc. It has also been established that the plant makes a highly nutritious fodder. The Institute has had large quantities of it planted along the North Sea and Baltic coasts. At an early stage in the experiments it was shown that *S. lacustris* has a very high cellulose content; a method of making paper from it was perfected, and the rights of production were acquired by the Italian chemical industry. In the opinion of the Plön scientists, this new way of making paper should in time make it possible to eliminate completely the exploitation of forests for producing the world's paper (3; 6.8.57).

Great Britain. The Nature Conservancy has announced the establishment of the following new nature reserves: Rodney Stoke woods on Mendip (Ash wood on carboniferous limestone); Coed Tremadoc, Caernarvonshire (relict Oak woodland on steep cliffs); and an addition to Coed Rheidol Nature Reserve (9; 13.7.57).

Borax Consolidated Ltd., London, have introduced a new product, Firebrake, for use against timber, brush and grass fires. It is a fine-textured sodium calcium borate, suitable for suspension in water and specifically designed to make use of the proven fire-retarding qualities of borates. It has been tested on a wide variety of natural fuels under varying conditions of terrain and climate, and during 1956 was used extensively by the U.S. Forest Service for fighting a number of critical bush and forest fires in California [cf. *F.A.* 17 No. 4066]. The solution is applied to the fuel, including ground litter, at a minimum rate of 3-5 gal./100 sq. ft. of ground area. Pre-treatment strips (in advance of fire movement) are usually at least 2 ft. wide. Maximum width, as in the case of cleared firebreaks, depends on fuel height, density etc. (18; August 1957).

Early this summer, foresters employed by the Derwent Valley Water Board on 4000 acres of Pine plantations in N. Derbyshire, were pestered and bitten by a plague of midges, so severely that they often had to stop work. The Chemicals Division of Newton Chambers & Co. of Thorncliffe, near Sheffield, has been called in to deal with the trouble. As a preliminary measure, use is being made of a large dusting machine capable of spreading Zaldeicide, an appropriate and effective insecticide, to a radius of 100 yards or more. Before work begins each morning, the area of ground to be covered during the day is thoroughly dusted. By this means the adult midges are killed while they are still dormant on the ground after the cool nights. Eventually the Board may use a Swingfog machine that can treat several hundred acres at once, spreading an effective fog evenly throughout the larger area. The ground where the foresters are working is a typical water-collecting area, damp and muddy, ideal as a breeding ground for midges, and the remedial measures are likely to be watched with great interest by other water boards as well as by the Forestry Commission (12; 20.8.57).

Italy. Colonies of the wood ant, *Formica rufa*, were successfully transferred to a Pine wood on Monte Penica which had been almost totally defoliated by the Pine processionary moth, and effectively controlled the outbreak (8; April 1957).

Philippines. An executive order signed by the President of the Republic of the Philippines has abolished the Forest Products Laboratory and the Forest Products Research Section of the Bureau of Forestry, and transferred their functions, appropriations, equipment, property, records and personnel to the Forest Products Research Institute. The Institute is a semi-autonomous research institution attached to the University of the Philippines for policy purposes, but with much freedom to manage its own business, personnel, and scientific activities (12; 18.7.57).

Rumania. During the spring of 1957, some 95,000 acres were planted with conifers and 38,000 with hardwoods, an advance of 14,500 acres on provisional plans for afforestation. A further 28,000 acres of land round new dams, on river banks etc. were planted in connexion with hydraulic undertakings. Considerable use is being made of exotics, notably Douglas Fir and *Abies grandis* (1; 1957).

Sweden. An instrument for automatically computing, from increment cores, the age and relative increment of trees, has been evolved by Professors Eklund and Langlet. The machine, which is a combination of electric computer and microscope, not only counts the growth rings but also measures their width from year to year, at a rate of 2000 rings per hour. It is being used both by the Institute of Forest Research and on the national forest inventory (11; June 1957).

Union of South Africa. A S. African inventor, T. L. Wadley, is spending 3½ months in Europe, discussing with scientific bodies the new system of microwave measurement of distances, known as the 'Tellurometer', on which he has been working for a number of years. It is claimed that the new device will revolutionize surveying, civil engineering, and large-scale construction work. It operates on the 10-cm. wavelength region, and measures the transit of radio waves over the length to be determined, with an accuracy of a fraction of a millimicrosecond. Measurements can be made by day or night, and visibility is immaterial. The instrument has a range of 100 ft. to 100 miles, but for practical purposes the maximum working range is ca. 35 miles. It is said to be the most important development in surveying since the invention of the theodolite (10; June 1957).

U.S.A. The Pine experimental laboratory at Hodges Gardens, Louisiana, is engaged on a programme of breeding Southern Pines in collaboration with the Texas Forest Service, its particular object being to achieve a satisfactory Slash $\times$ Loblolly Pine hybrid. In the greenhouse laboratory is a tree known as 'the world's most homogenous [heterogeneous] Pine'. It has 38 grafts, and is kept in bandages. Temperature in the greenhouse is kept at 70° and r.h. at 90% all the year round (6; Spring 1957).

A former viticulturist at the University of California has designed a grafting machine with which 3 reasonably skilled men can make between 700 and 1000 vine grafts per hour, the grafts comparing favourably with short whip grafts made by a skilled grafter. The machine is a portable one, to be used in a shed or other set place, but can be modified for field grafting. Propagators of roses and fruit trees are reported to be interested in this equipment (2; 1.8.57).

The directors of Clinton County (N.Y.) Soil Conservation District are offering the local farmers a service for thinning their woodlots by poisoning with Na arsenite at a cost of \$25.00/acre. Many valuable White Pine stands in the district are stagnant, but ordinary thinning methods cost \$50.00–\$100.00/acre. The work is done by 2-man teams during the 'peeling season' (May–August). Farmers can sell the killed trees for pulpwood if they are of merchantable size (15; August 1957).

An improvement in the technique of chemical barking is to make longitudinal axe slits in bark on felled trees. Tests have shown that slits should be at 18-in. intervals below branches and 6 in. among branches for softwoods, while a closer spacing of 6–8 in. is recommended for hardwoods. This facilitates barking when the tree is left in the woods for several weeks after felling (5; June 1957).

A set of tubeless tyres is being tested on a regular logging road by a Washington logger. The operator reports that no repairs have been necessary in 38,000 miles on one of the 4 truck-trailer units doing 300 miles a day with average load of 5000 bd. ft. (5; June 1957).

A leading shoemaker in St. Louis is taking advantage of the resilience and shock-absorbing qualities of wood by using it in golf shoes. Specially treated Birch wood is used for 'foundation inserts' between the inner and outer soles. The manufacturer says that the wood inserts lessen fatigue, insulate the feet against hot fairways, damp and cold, and produce a firmer stance (16; 15.8.57).

About 45,000 trees are lost annually in New York City, a majority of them owing to the toxic effect of dogs, which are said to average 70–80 daily visits per tree. The attempted remedy in some New Jersey municipalities is an ordinance prohibiting the walking of dogs within 2 ft. of street trees (14; July 1957).

A 'robot' tractor that can be operated by radio control is being tested by the U.S. Army. Control is practicable to a distance of 15 miles and includes starting and stopping the engine, engaging and disengaging gears, operating in forward or reverse, manipulating dozer blades, and activating the steering mechanism. Fire-fighting is a sphere in which such a unit might have applications (5; July 1957).

U.S.S.R. Russian botanists have discovered, growing in the Bet-Pak-Dala desert on the Karatau and Alatau foothills, a plant hitherto known only from the Tertiary Era. The *Spiracanthus* is a woody shrub or low tree, 3–6 m. high, with fragrant pink and white flowers and wood of a fine dark red colour. It is able to endure drought and extreme changes in temperature. It is being successfully cultivated at the Kazakhstan Botanical Garden (4; 15.6.57).

